NOVEMBER 19, 1951

# Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

# 100 AMP. CIRCUIT BREAKER PROTECTION AT FUSE BOX PRICES

## Another new Murray product

## that gives you

## *Fully Magnetic!* protection

### LOW PRICE!

In the Murray 100 Amp. Service Control you get circuit breaker protection priced as low as comparable fused equipment.

### MANY ADVANTAGES!

1. Fully magnetic circuit protection.
2. Carries full load regardless of temperature.
3. Plenty of room for easy wiring.
4. Compact (12-1/16 x 6-13/16 x 3-7/8 — Indoor, surface type).
5. Easy to gang (No side handles).
6. Flush or surface mounting.

### WHAT IS IT?

Service control equipment—3 wire, single phase, 120-240 Volts AC. Available in two types: 1—Indoor (surface or flush) or 2—Outdoor (raintight). Supplied with handle extensions for simultaneous manual tripping of two single pole independent trip fully magnetic circuit breakers in 70, 90, or 100 amps.

### HOW IS IT USED?

1. Same application as a 100 amp. 3 wire fused switch with neutral or a 100 amp. 2 wire fused switch without neutral.
2. As Service Entrance Equipment.
3. As a main disconnect.
4. For protecting single phase lighting and appliance circuits or for fractional horse-power motor circuits.

### IS IT AVAILABLE?

Yes! Call your distributor or contact your nearest Murray representative. Catalog numbers: Indoor—LV2IIA (Add S or F to indicate surface or flush mounting). Outdoor—LR2IIC (At slightly higher list price).

Murray®

*FOR DETAILED INFORMATION, WRITE:*

**MURRAY MANUFACTURING CORPORATION**

1250 Atlantic Avenue • Brooklyn 16, New York

Service Entrance & Meter Equipment • Magnetic Circuit Breakers • Switches
Current Limiting Reactors • Crows'nest Aerial Ladders

## FARM ELECTRIFICATION

How much does the farm electrification market amount to?

What's its potential in the coming five years?

How much of an increase in annual use of electricity will result from growing farm electrification?

These are all $64 questions to the manufacturers of electric farm equipment and to electricity suppliers.

Heretofore these questions could be answered only in the vaguest terms, if at all, even though everybody recognized the need for some figures of substance and definition.

So Electrical World, with Associate Editor Frank Innes doing the steering, undertook a joint study of the field with the National Electrical Manufacturers Association.

### Survey Field

Making a definitive survey turned out to involve ramifications somewhat complicated, to say the least. It has been estimated, for example, that there are more than 200 practical applications of electricity on the farm. And REA Administrator Claude Wickard said recently in an article in The New York Times' Sunday Magazine that there are more than 400.

Obviously, we couldn't compile a questionnaire to include all of these; for one thing, there's a lot of overlapping. So, after some pretty involved discussions with men expert in the field, it was decided to send the survey to 104 manufacturers who seemed representative of all farm electrification products.

### Article Coming

For the conclusions compiled, you'll have to read the article by Frank Innes in the forthcoming (December 3) issue of Electrical World. But we can tell you now that the potential market for electrical goods in this field is big, and that the increase in kilowatthours totalled by this growing market is big, too.

As with all market projections, there are a couple of big "ifs."

1. The extent to which war, or the threat of war, will affect our economy.

2. The amount of planning and aggressiveness placed behind the selling of the goods and services involved in farm electrification.

# Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

Vol. 136 No. 21 CONTENTS November 19, 1951

**Editorials** ..... 85

**News**

| | | | |
|---|---|---|---|
| The Electrical Week | 87 | Technical Notes | 98 |
| Industry Mobilization | 95 | News About People | 174 |
| Financial News | 96 | Manufacturers & Markets | 180 |
| Washington Comment | 98 | New Electrical Construction | 183 |

**Features**

How to Find and Stop TV Interference...F. L. Greene and S. C. Bartlett 99

Develop 160 Mw at Bull Shoals.....Louis E. Bona and Thomas B. Lewis 105

Electric vs Gas Furnace Operations.....A. D. Spillman 108

Keep 4 kv in Old Areas, Use 11 kv in New.....George A. Davis 112

Economy in Substation Design.....C. E. Winegartner and R. A. Hunt 116

**Departments**

| | | | |
|---|---|---|---|
| How To | 122 | What They're Saying | 174 |
| Engineering Reference Sheet | 130 | Book Reviews | 185 |
| Industrial Applications | 146 | Catalogs | 186 |
| Sales and Service | 148 | Index of Advertisers | 189 |
| New Equipment | 156 | Letters | 192 |

RALPH H FLYNN, Publisher FISCHER BLACK, Editor DANIEL T BRAYMER, Managing Editor

ARCHER E KNOWLTON..Senior Associate Editor RUE M SHOOP.....Middle Eastern Editor
FRANK R INNES.....Associate Editor HOWARD S KNOWLTON....New England Editor
ROBERT C BLATT.....Associate Editor EDWARD ALLEN .....Midwestern Editor
KENNETH K KOST.....Associate Editor JOSEPH A ROBINSON.....Western Editor
FRANCIS J KOVALCIK.....Assistant Editor BERLON C COOPER.....Lighting Consultant
JOHN F WICKLEIN.....News Editor GEORGE B BRYANT, Jr, Mgr. Washington Bureau
JEANNE BERNHARDT....Assistant News Editor JESSE MOCK.....Washington Correspondent

WORLD NEWS BUREAU, Russell F Anderson, Editor; London, Paris, Frankfort, Moscow, Tokyo, Bombay, Melbourne, Rio de Janiero, Buenos Aires • DOMESTIC NEWS SERVICE, Atlanta, Chicago, Cleveland, Detroit, San Francisco, Houston. Correspondents in 43 principal cities • ECONOMICS DEPARTMENT, Dexter M Keezer, Director; William F Butler, Robert P Ulin

ADVERTISING STAFF: District Managers, E F Coffey, New York; N V Palmer, Boston; F P Coyle, Philadelphia; M S Kearney, Cleveland; E S Chapin, Detroit; W H Menelley, Chicago; J T Schaefer, St. Louis

November 19, 1951 ELECTRICAL WORLD Vol. 136, No. 21

Member ABC and ABP

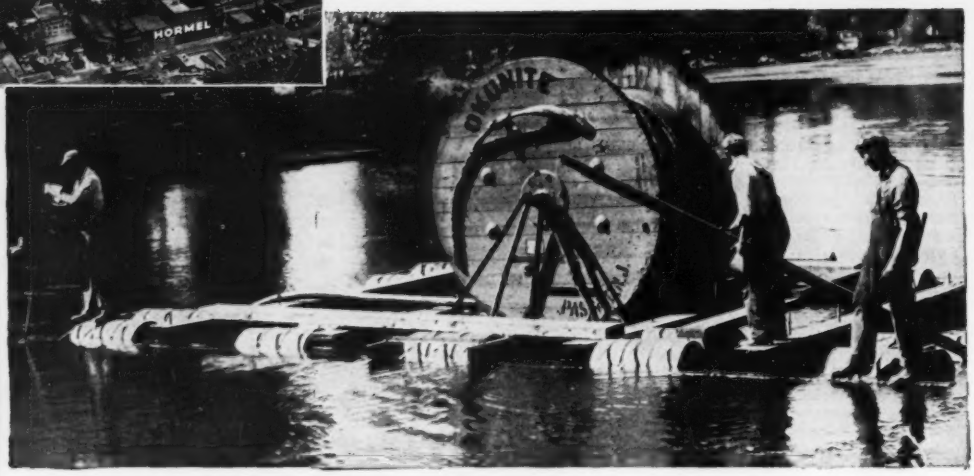
Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office, 99-129 North Broadway, Albany 1, N. Y. Executive, Editorial and Advertising Office: McGraw-Hill Building, 330 W. 42nd St., New York 18, N. Y.** Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

**Subscriptions: Address correspondence to Electrical World—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 18, N. Y. Allow ten days for change of address.**

**Please indicate position and company connection on all subscription orders.**

Single copies 35¢. For the United States and possessions $6 a year, $9 for two years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money, at par.) Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second class matter, November 18, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in USA. Copyright 1951, by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

# HORMEL *Makes Sure*




# ...with OKOLITE cables

## Costly perishables depend on uninterrupted power transmission

At Hormel's plant in Austin, Minn.—home of famous "SPAM"—thousands of dollars worth of meat are constantly being processed. Any breakdown or stoppage of electrical service would cause a tremendous loss.

When Hormel enlarged its electrical requirements, engineers installed two 13.8 kv Okolite submarine cables to convey power from the municipal plant across the Red Cedar River to the Hormel switchboard. Cables were laid from a raft specially constructed to clear obstructions in the river.

Here are some of the reasons why Okolite-insulated cable was chosen for this important installation:

Long-lived, electrically-strong Okolite insulation resists corona cutting, heat and moisture, requires no lead sheath, even when totally submerged. Okolite has an outstanding record in submarine cable service for voltages up to 35,000 volts.

All Okolite-insulated cables, whatever their end use, are subjected to super-voltage a-c and d-c tests considerably in excess of industry specifications.

On any installation where uninterruptetd service is imperative, Okonite is your best cable buy—to be sure. The Okonite Company, Passaic, N. J.

*THE BEST CABLE IS YOUR BEST POLICY*

OKONITE *insulated wires and cables*

**An efficient plant lighting system** such as this adds production during night time hours to daytime plant operating schedules . . . permits increased production potential at minimum cost.

And, when plant lighting jobs of similar nature are planned, Graybar offers convenient "single order" service on all the lighting units, lamps, conduit, and wiring materials required.

# LIGHT for round-the-clock production

**Offices, schools, and commercial buildings** need sight-saving lighting, too. They'll appreciate the way their nearby Graybar office provides efficient service and scheduled deliveries.

Your industrial customers, today, face a dual responsibility. They must meet increased defense quotas and, at the same time, retain their regular markets through continued production of normal lines.

An efficient plant lighting system for round-the-clock operations is an obvious answer. It automatically increases plant production hours . . . improves employee efficiency and reduces spoilage even on normal daytime shifts.

Graybar—in co-operation with utilities and electrical contractors—has planned and supplied lighting systems of every type. That's why, when you back up your recommendations with Graybar as supplier, you can be sure that the light will be right for the job—the *right* unit . . . the *right* quality . . . the *right* characteristics.

Graybar Lighting Specialists will be glad to work with you in the selection of equipment for any lighting application. You can count on them to give an entirely impartial recommendation, for Graybar distributes the most complete selection of lamps and lighting units available from a single source. 186-911

**GRAYBAR ELECTRIC COMPANY, INC.**
***Executive Offices:* Graybar Building, New York 17, N. Y.**

*You get the best of everything electrical . . . via* GraybaR

IN OVER 100 PRINCIPAL CITIES

# This Wide Acceptance is No Accident!

NETWORK TRANSFORMERS have to be tougher than most transformers. Not only are they subject to temperature extremes and overloads, but they have to withstand unusually severe operating conditions, flooding and corrosive atmospheres. Because they may have to operate in narrow, below-sidewalk vaults, maintenance is an important factor to consider.

That's why utility engineers are particular about the network transformers they choose for their systems.

One of the best testimonials to dependable all-around performance of Allis-Chalmers network transformers is the increasing approval of utilities and consulting firms throughout the country. Today the A-C label on major electrical systems is a familiar sight. Approximately 1¼ million kva of Allis-Chalmers network transformers are now serving the most important systems in the country.

This vote of confidence is based upon top performance. Details of welding, protective undercoating, convenient location of gages, sturdy core and coil construction and tank design make this outstanding performance possible.

Allis-Chalmers makes all three types of network transformers: oil-filled, *Chlorextol* liquid-filled and the new sealed dry type. Your Allis-Chalmers engineer can make unbiased recommendations on the best type for your particular requirements.

Why not call your local A-C office for more information. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 61B6152A.

A-3515

*Chlorextol* is an Allis-Chalmers trademark.

## LOOK

**To Allis-Chalmers Network Transformers For:**

- **Compactly designed** circular coil structure. Outside core clamping bolts, sturdy turn-to-turn insulation, built to withstand heavy short-circuit stresses. Thermal capacity is high for cool operation under severe load conditions.
- **Strong construction.** Main cover and switch compartment are welded to the tank to do away with gasket trouble.
- **Easy control** of tap changer operated through a two-inch outlet in the main cover. Eliminates packing gland maintenance.
- **Extra protection** of undercoating compound . . . plus sandblasting and three coats of baked-on phenolic base paint formulated to give high water resistance.

# ALLIS-CHALMERS

***Network Transformers—Over 1,000,000 KVA Installed***

## Choose More than a Truck

# Choose equipment that makes crews happier and more productive

Ask for data on over 70 different FWD Line Construction & Maintenance Units

**"Us linemen sure like an FWD. It gets us where we want to go with no 'crowding' . . .** takes the tools we need with us and always has 'em handy. With an FWD —we're sure of getting there — and getting back."

**"When my crews go out for line construction or maintenance**—they pick the FWD to go with 'em every time. Seems it helps get more work done easier—in less time —and they go on and off the road with greater safety."

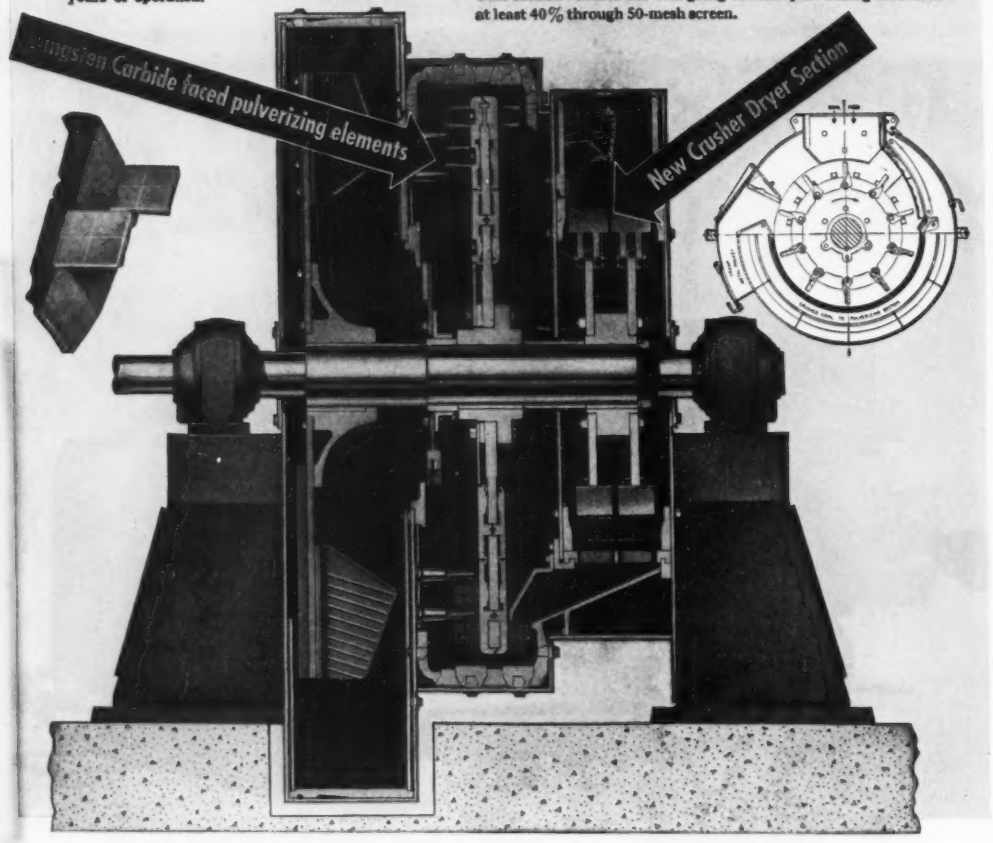
WHEN you choose an FWD — you choose more than a truck — you get a specially engineered utility service unit—completely equipped for the job. That means you'll get more jobs done in less time—easily meet routine schedules—restore service in emergency faster. Ask for the whole FWD story—about FWD utility-engineered models — four and six wheel drives. THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. • Canadian Factory — Kitchener, Ontario. *World Wide Sales and Service.*

***America's Foremost Heavy-Duty Truck***

# The New "RILEY 50" Pulverizer

**Gives long uninterrupted operation, low maintenance and sustained fineness over years of operation.**

**Where the free moisture is evaporated—no capacity reduction with high moisture—where foreign materials in coal are rejected. This section reduces the coal going to main pulverizing section to at least 40% through 50-mesh screen.**




We can merely touch on the many operating advantages of the new Riley "50" pulverizer in a two-page ad. The Riley "50" is the most significant pulverizer development in the past decade. Write for the story of the Riley "50." It will pay you to thoroughly investigate the Riley "50" before purchasing coal pulverizers.

TRADE MARK Rx REGISTERED

# RILEY

**STOKER CORPORATION, WORCESTER, MASS.**

Boston · New York · Philadelphia · Washington · Buffalo · Pittsburgh · Cleveland · Detroit · Chicago
Cincinnati · Atlanta · New Orleans · St. Louis · Kansas City · St. Paul · Tulsa · Houston · Denver
Salt Lake City · Los Angeles · Portland · Seattle

**BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS**

# *Spontaneously* Accepted by Engineers

## Because of These Outstanding Features

*1 No capacity reduction with increase in moisture.

2 Tramp iron, iron pyrites and other foreign materials in coal rejected.

*3 Pulverizing elements faced with tungsten carbide.

4 Fineness sustained over years of operation.

5 Long periods of operation without necessity of shutdowns.

*6 Unusually high capacity per unit of space.

*7 Minimum foundation requirements.

*8 Ability to carry low loads.

9 Flexibility-wide load range.

*10 Operates without coal, with no noise and without wear or damage to parts.

11 Low maintenance and power.

*12 No explosion hazard, travel of coal through pulverizer faster than flame propagation.

*13 Quiet vibrationless operation.

*14 Ease of lighting and regulation.

15 High primary air temperatures.

16 Thoroughly dependable.

*17 Negligible cost of lubrication.

*18 All moving parts on a single horizontal shaft with bearings outside of housing. No worms or gears.

*19 Primary air fan integral with pulverizer —separate fan and motor not required.

**No other pulverizer can approach the Riley "50" in these important characteristics.*

***All of these companies have ordered Riley "50" Series pulverizers within the past year***

**Public Utilities**

*Monongahela Power Co.
*Iowa Electric Light & Power Co.
Utah Power & Light Co.
*Northern States Power Co.
*The Potomac Edison Co.
*Superior Water, Light & Power Co.
Central Ohio Light & Power Co.
*City of Owensboro, Ky.
City of Austin, Minn.
*Corn Belt Power Co-operative
*Public Service Co. of Colorado
Hartford Electric Light Co.

**Industrial Plants**

St. Croix Paper Co.
Hooker Electrochemical Co.
*Pittsburgh Plate Glass Co.
Celanese Corp. of America
United States Steel Co.
*Western Electric Co.
*Continental Can Co.
Monsanto Chemical Co.
Northern Paper Mills
Bell Aircraft Corp.
Syracuse University
Riegel Textile Corp.
Owens Corning Fiberglas Co.
*U.S. Finishing Co.
*Ciba States, Ltd.
*East Newark Realty
Lawless Brothers Paper Co.

**These companies have never previously used Riley pulverizers. The other companies have repeatedly ordered Riley pulverizers.*

**These contracts were engineered by the following consultants**

Bechtel Corporation
Ebasco Services
Chas. T. Main, Inc.
Pioneer Service & Engineering Co.
Sargent & Lundy
Sanderson & Porter
Stone & Webster Engineering Corp.
Black & Veatch
United Engineers & Constructors
Stanley Engineering Co.
Kenneth R. Warrington
J. V. Edeskuty
Francisco & Jacobus
Douglas M. McBean
Robson & Woese, Inc.

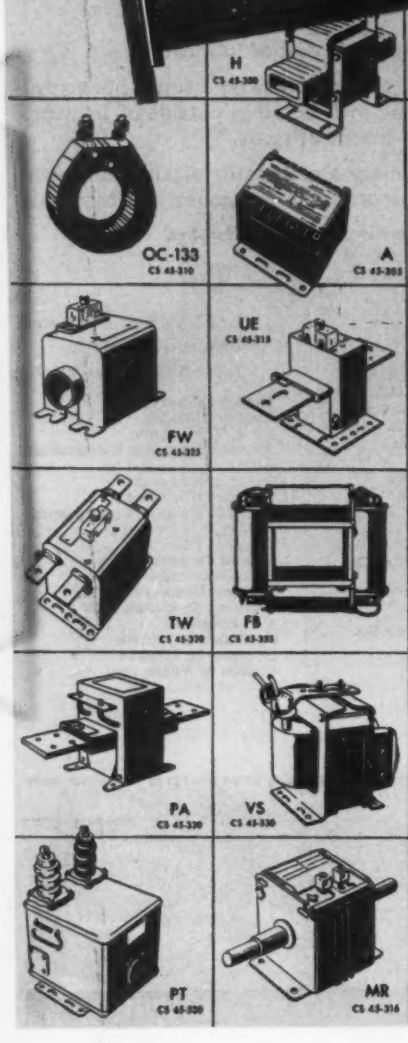
*A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs*

# COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment.

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

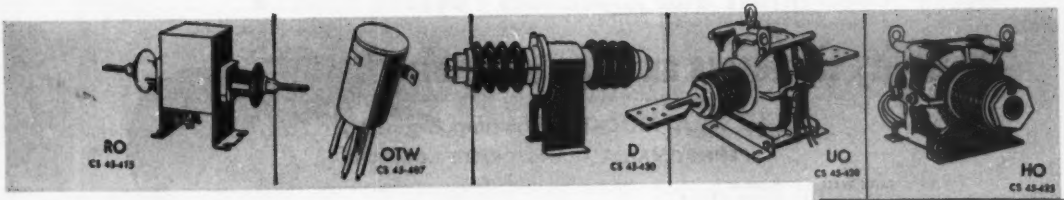
# The most complete line of Instrument Transformers in the industry



**TYPE OCT**
25,000 to 138,000 volts
CS 45-445

**TYPE OPT**
24,000 to 69,000 volts (two bushing)
CS 45-640

**TYPE OPT**
14,400 to 80,500 volts (single bushing) for 25 kv to 138 kv systems
CS 45-640



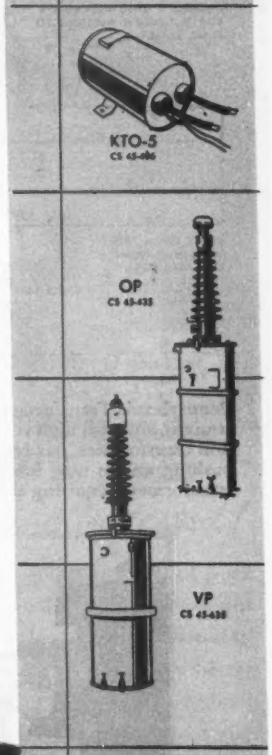

## Specific answers for specific needs!

The complete line of Westinghouse Instrument Transformers contains a type and rating for every requirement.

For example, if you have a problem in accurate metering on a 69-kv line averaging 800 amps, the Westinghouse Types OCT-69 for current, OPT-69 (single or two bushing) for voltage, are designed to supply meters rated 5 amps and 115 volts.

The Types OCT and OPT have been designed especially for outdoor service. They are oil filled, have improved weather-shed bushings and have an element-resisting finish on metal surfaces. They are built to conform to the highest accuracy standards established by ASA. Similar types are available for a wide range of ratings.

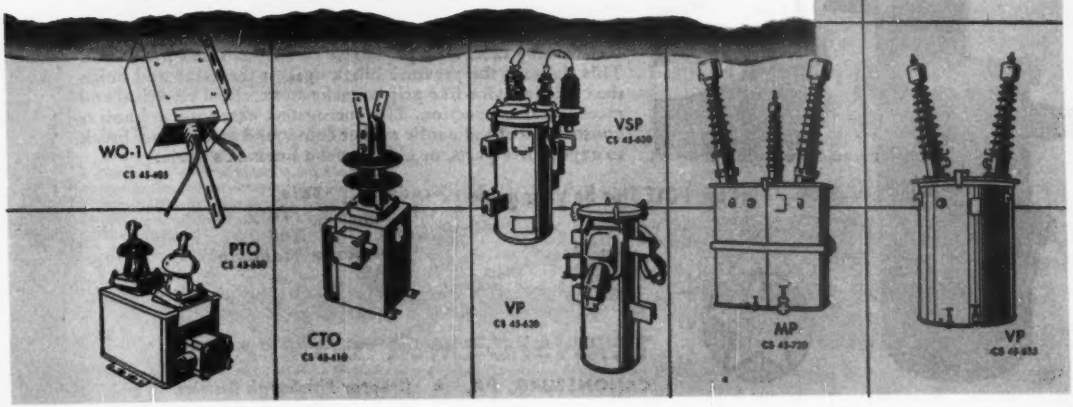
Others cover metering, relaying, indicating and auxiliary applications. For complete information on any of the types listed, ask your Westinghouse representative for a copy of the catalog identified by the "CS" number under each illustration; or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70589




YOU CAN BE SURE.. IF IT'S

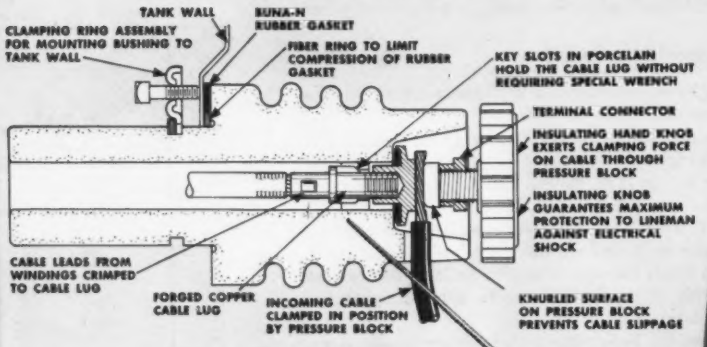
# Westinghouse

INSTRUMENT TRANSFORMERS



# "Our New POLE STAR HIGH VOLTAGE BUSHING has every Mechanical and Electrical Feature desired by Utility Engineers and Operating Men"

*says* **W. A. MOCKER,** ***Planning Engineer,***
**PENNSYLVANIA TRANSFORMER COMPANY**


TANK WALL
BUNA-N RUBBER GASKET
CLAMPING RING ASSEMBLY FOR MOUNTING BUSHING TO TANK WALL
FIBER RING TO LIMIT COMPRESSION OF RUBBER GASKET
KEY SLOTS IN PORCELAIN HOLD THE CABLE LUG WITHOUT REQUIRING SPECIAL WRENCH
TERMINAL CONNECTOR
INSULATING HAND KNOB EXERTS CLAMPING FORCE ON CABLE THROUGH PRESSURE BLOCK
INSULATING KNOB GUARANTEES MAXIMUM PROTECTION TO LINEMAN AGAINST ELECTRICAL SHOCK
CABLE LEADS FROM WINDINGS CRIMPED TO CABLE LUG
FORGED COPPER CABLE LUG
INCOMING CABLE CLAMPED IN POSITION BY PRESSURE BLOCK
KNURLED SURFACE ON PRESSURE BLOCK PREVENTS CABLE SLIPPAGE

Pennsylvania Transformer Company, pioneer of the straight, sidewall high voltage bushing for distribution transformers, has re-designed its high voltage bushing and is now installing it on all Pole Star transformers requiring sidewall bushings.

## ELECTRICALLY CO-ORDINATED

The Basic Impulse Level of the bushing is co-ordinated with the transformer windings. When the transformer is subjected to a voltage surge above the BIL of the bushing, the bushing will flashover on the outside. A separate, completely co-ordinated bushing is available for each voltage class—5 Kv and 8.6 Kv.

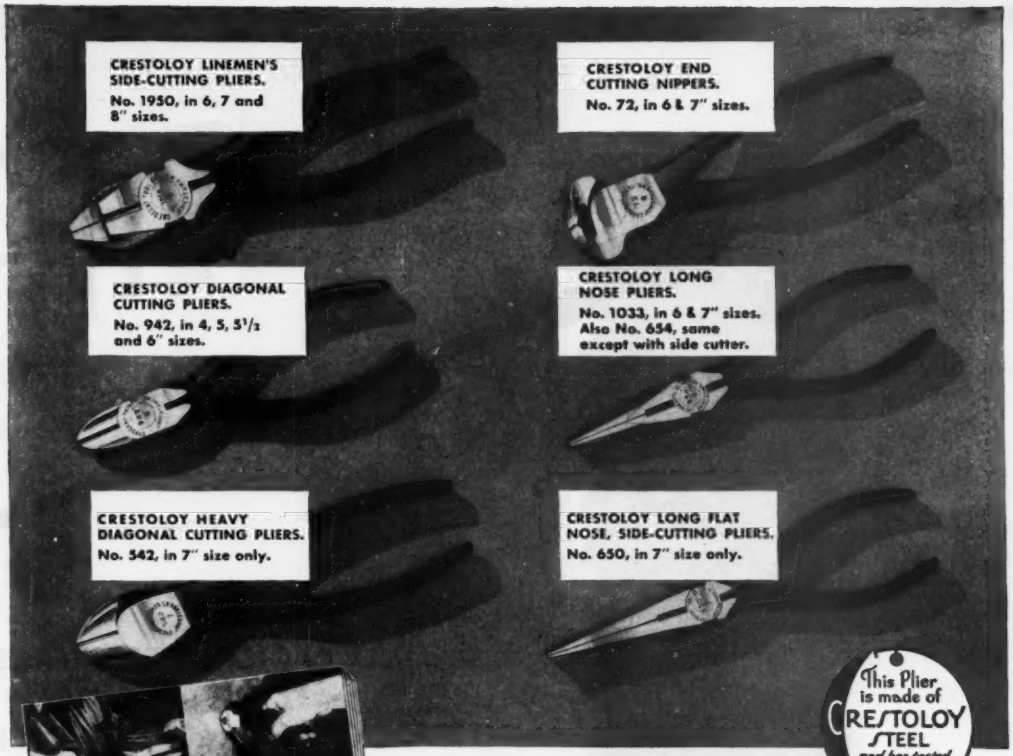
## MECHANICALLY IMPROVED

The new Pole Star bushing is extra strong and extra safe. No tools are needed to make a line connection. *You simply insert the incoming cable through the side opening and turn the handle.* This tightens the pressure block against the cable and holds the cable in a vice-like grip to make an excellent electrical and mechanical connection. The corrugated, easy-to-grip knob is constructed of a phenolic rubber compound and will not break to expose live parts, or chip to cut a lineman's glove.

**Let the POLE Star be your guide**

Product Of Long Experience — Safe Thrifty And Reliable

**Pennsylvania**
**TRANSFORMER COMPANY**
**CANONSBURG, PA.** • ***Greater Pittsburgh District***


CRESTOLOY LINEMEN'S SIDE-CUTTING PLIERS.
No. 1930, in 6, 7 and 8" sizes.
CRESTOLOY END CUTTING NIPPERS.
No. 72, in 6 & 7" sizes.
CRESTOLOY DIAGONAL CUTTING PLIERS.
No. 942, in 4, 5, 5½ and 6" sizes.
CRESTOLOY LONG NOSE PLIERS.
No. 1033, in 6 & 7" sizes. Also No. 654, same except with side cutter.
CRESTOLOY HEAVY DIAGONAL CUTTING PLIERS.
No. 542, in 7" size only.
CRESTOLOY LONG FLAT NOSE, SIDE-CUTTING PLIERS.
No. 650, in 7" size only.

This Plier is made of CRESTOLOY STEEL and has tested 100% satisfactorily

# CRESTOLOY PLIERS

## *are individually tested!*

Crestoloy Pliers take all the guesswork out of plier buying, because Crescent has taken all the guesswork out of plier making. Rigid specifications establish the material, design, workmanship, tests and inspection of these better tools. Strict adherence to these specifications is maintained by continuous tests and relentless inspection of the *individual* tools. Every plier carries the Crestoloy tag certifying that it has been individually tested.

**GET YOUR FREE COPY . . .**

This new 20-page booklet provides many useful how-to-do-it ideas both for amateurs and professional mechanics, as well as basic information on the proper selection, use and care of hand tools. 93 illustrations. Write today.

**CRESCENT TOOLS**
*Give Wings to Work*

*Sign of the Artisan*
*Symbol of Excellence*

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

# FOR

...NO RADIO INTERFERENCE

...NO CRACKING ...NO PUNCTURE

...GREATER RESISTANCE TO

...BETTER PERFORMANCE UNDER

...LOWEST REPLACEMENT AND

***ISN'T IT TIME FOR YOU***

# 20 YEARS,,

...NO CLEANING

STONES AND BULLETS

ARCOVER

MAINTENANCE COST

***TO STANDARDIZE ON LAPP LINE POSTS?***

# Lapp

**LAPP INSULATOR CO., INC., LE ROY, N.Y., U.S.A.**

# How you can use standardized Power Transformers where "specials" seem to be required

*. . . and get up to 5 months faster shipment and 8% lower price*

While systems are being modified to conform more closely to EEI-NEMA Preferred Voltages, many transformer applications arise which apparently require special voltages, impedances and tap arrangements. Often, you can meet these requirements with G-E Repetitive Manufacture transformers and, at the same time, obtain attractive savings in both time and money. For example, with RM Transformers . . .

**You can operate at non-standard voltages:**

One optional feature of RM transformers provides that the high-voltage rating for each insulation class above 5-kv can be varied over a 20% range. This means, also, that by under-exciting you can obtain *secondary voltages* other than EEI-NEMA Preferred Voltage ratings. There may be some sacrifice in rating, of course—but you will get *more kva per dollar* than with a special transformer.

Example: You have a standard 34.5-kv primary, but want a non-standard low voltage of 2300. Select an optional RM rating of 36-to-2.4 kv. Operate at 34.5 kv. You'll get your 2300 volts.

You pay 1% for the optional voltages. You save 8% in base price. You get much faster delivery.

**You can get all taps above or below the actual primary voltage:**

With RM transformers, you get two taps above and two below the rated primary voltage. By selecting an optional primary rating, you can get all four taps above (or all below) your actual line voltage.

Example: Your high voltage is 34.4 kv. You want all taps below this. By selecting 32.8 kv for the primary rating, you get taps at 34.4, 33.6, 32.0 and 31.2 kv.

You pay 1% for the optional voltage. You save 8% in base price. You get much faster delivery.

**You can parallel transformers with different impedances:**

Impedances of RM transformers are fixed at 5.5% to 7.0%, depending on high voltage. While this affects division of load when an RM unit is paralleled with an existing transformer, it is *not* as critical as you might think. It seldom results in a serious loss of capacity. Example: You want to parallel a 34.4-kv RM transformer (impedance, 6%) with an existing unit having an impedance of 6.6%. Theoretical division of load is about 52%—48%. Often actual division will be even better than this because of external impedances. At worst, you have lost less than 5% in capacity. You have saved 8% in cost, gotten much faster delivery.

**You can parallel △-Y with Y-△**

While in most ratings, RM transformers are available as △-Y or △-△, a △-Y RM transformer can almost always be paralleled with an existing Y-△ unit. In fact there is one advantage: You can ground the high side through the old unit, the low side through the new RM.

**You have 20 options available:**

These include: optional primary voltages—load-ratio control—bushing current transformers—fans or provisions for future fans—junction boxes, and many others. RM (Repetitive Manufacture) power transformers are available in ratings up to 5000 kva single-phase and 10,000 kva three-phase. The ratings cover all EEI-NEMA Preferred Voltages—high and low—up to 69 kv.

Let us help you apply RM transformers. For additional information call your nearest G-E representative or write for Bulletin GEC-479. General Electric Co., Schenectady, N. Y.

401-21

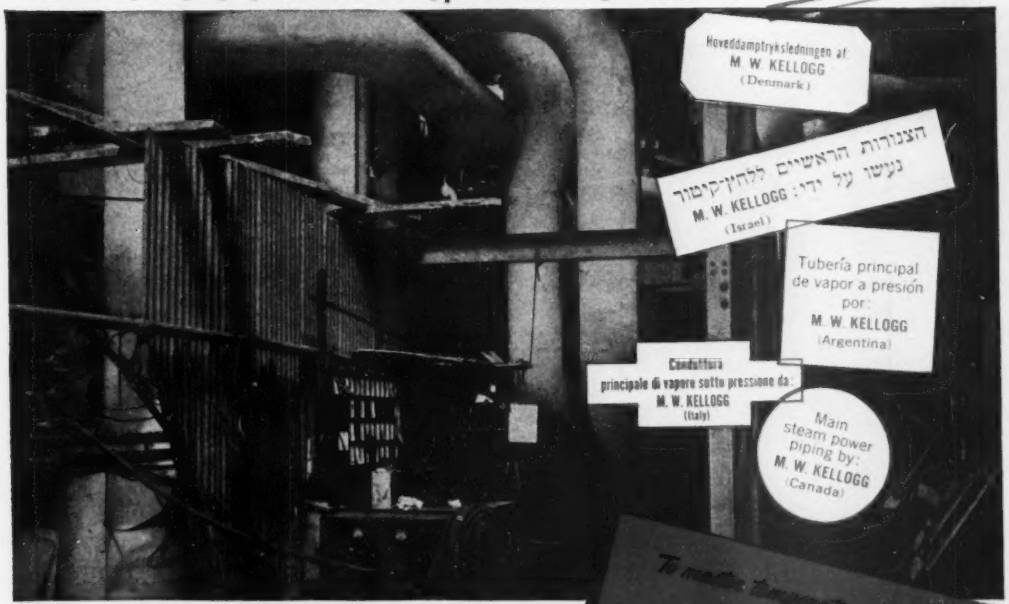
GENERAL ELECTRIC

*Note: it's an International "spec" now!*

. . . fifteen new 50,000 kw. or larger turbines scheduled for seven countries outside the U. S. . . . plus six smaller units for a grand total of more than a million new kilowatts of capacity—all main steam and reheat piping by Kellogg . . . all alloy piping for as high as 1000 F. In every case, Kellogg is fabricating the sub-assemblies and is also supervising the final installation. The basic reasons that "main steam piping by Kellogg" is now an International spec are found in Kellogg's many years of experience in this highly specialized field. . . . in the Kellogg installations, for more than 600,000 kws. completed since the war in these same countries . . . and in the better than 2 million kws. of alloy installations completed, or now in work, for U. S. utility company operations at temperatures as high as 1100 F.

Canalisation principale de vapeur sous pression par: M. W. KELLOGG (France)

Entubación principal de vapor a presión por: M. W. KELLOGG


Hoveddamptryksledningen af: M. W. KELLOGG (Denmark)
M. W. KELLOGG (Israel)
Tubería principal de vapor a presión por: M. W. KELLOGG (Argentina)
Condutture principale di vapore sotto pressione da: M. W. KELLOGG (Italy)
Main steam power piping by: M. W. KELLOGG (Canada)

To make temperatures, pressures and chemicals use

**M. W. KELLOGG**

piping and process equipment

**Special studies** of unusual problems such as graphitization to assure long life and low maintenance.

**Metallurgical research** by recognized specialists who have made major contributions in this field.

KELLOGG 50th ANNIVERSARY 1901 - 1951

**Exclusive Equipment** for accurately analyzing stresses in piping and providing unique data for critical installations.

**Complete facilities** for the fabrication of steel products from simple forgings to specially cast bi-metallic devices.

**Top welding performance** in shops and in the field by welders accustomed to working under X-Ray checks.

**Quality control,** devised by metallurgical experts, embracing forming, heat treating and non-destructive testing.

**Pressure Vessels**
**Vacuum Vessels**
**Fractionating Columns**
**Drums and Shells**
**Heat Exchangers**
**Process Piping**
**Bends and Headers**
**Giant One-Piece Bends**
**Forged and Welded Fittings**
**Radial Brick Chimneys**

★

*The M. W. Kellogg Company, (A Subsidiary of Pullman Incorporated) — Offices in New York, Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris.*

# the DUNCAN

## HEAVY DUTY FAMILY IS GROWING!

SELF-CONTAINED METERING OF LOADS UP TO 200-AMPERES

Duncan Type HD Heavy Duty Motor Mounting Device

. . . For POLYPHASE 1-, 2-, or 3-phase 3-wire installations—The new Type MH-52 50-ampere meter provides for accurate measurement of continuous load currents up to 200-amperes.

. . . For SINGLEPHASE DEMAND—The Type TF-52 50-ampere, 240-volt, 3-wire singlephase watthour-demand meter will provide accurate energy and demand readings to 200 amperes or 48 KW.

. . . For SINGLEPHASE—The Type MF-52 50-ampere, 240-volt, 3-wire singlephase meter has capacity for accurate metering of continuous load currents up to 200-amperes.

THE DUNCAN family of Heavy Duty Equipment is continually growing in size and acceptance. By the elimination of current transformers for load currents between 100 and 200 amperes, appreciable savings are made in installation cost and mounting space. There is no better method of metering 1-, 2-, or 3-phase 3-wire services. Try these Duncan Heavy Duty combinations on your next installations in this capacity range.

*makers of watthour meters for thirty years*

**DUNCAN**

DUNCAN ELECTRIC MFG. CO. LAFAYETTE, INDIANA

# LOCKE

## *presents masterpieces of*

## insulator engineering

Tens of millions of

**LOCKE SUSPENSION INSULATORS**

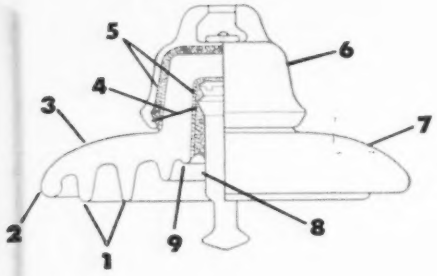
typified by

**No. 1840**

shown above . . . are in use on the world's high voltage transmission lines, some having been up since 1904. Certainly here is eloquent proof of their superior performance and broad acceptance. Specify them on your system.

# *Presenting* A MASTERPIECE OF INSULATOR ENGINEERING

## The LOCKE Suspension Insulator




## LOCKE DESIGN gives you ALL these advantages

**1.** The contours of the corrugations are such as to give maximum resistance to mechanical impact consistent with total weight and balanced electrical characteristics. The depth of the corrugations assures full leakage distance and maximum impact values.

**2.** The heavy, reinforcing bead on the outer edge of the porcelain shell is an additional assurance against chipping.

**3.** Compression Glaze—a Locke development—assures high resistance to damage from thermal shock or mechanical impact. This means that Locke insulators can be handled faster in construction without danger of chipping or breaking.

**4.** The insulator arch is formed between the cap edge surface as the abutment and the stepped pin as the keystone. Thus while loaded in tension, the porcelain itself is working in compression and the best characteristics of all materials are utilized.

**5.** Locke Compression Sand at the cement joints adds to the strength, and the stability of that strength, throughout the life of the insulator.

**6.** Galvanizing is done by the exclusive Locke Permazinc process—a quality-controlled, double hot-dip method that assures the highest degree of resistance to weathering and corrosion.

**7.** The uniformly smooth glazed surface assures easy natural cleaning by wind and rain, and aids the insulator in maintaining its originally excellent electrical characteristics.

**8.** The large diameter of the pin extends beyond the cement line. This assures cement joints of minimum radial thickness, freedom from troubles arising from thick cement joints, and reduces leakage current concentration (with its resulting corrosion hazard) at this point.

**9.** This small barrier (petticoat) adjacent to the pin reduces leakage streamers and adds to pin life.

**10.** Since Fred M. Locke made the first wet-process porcelain insulator in 1893, a long list of Locke "firsts" has emerged: the first successful cemented type suspension insulator in 1904; the first switch insulator in 1909; the first radio-freed pin type insulator in 1932, to name but three.

**YOU ARE EQUALLY SURE** of getting a masterpiece of design when you specify other products in the complete line of Locke insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus. Locke Department, General Electric Company, Baltimore, Maryland.

# LOCKE

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

OUT INSULATORS

LIQUID-FILLED BUSHINGS

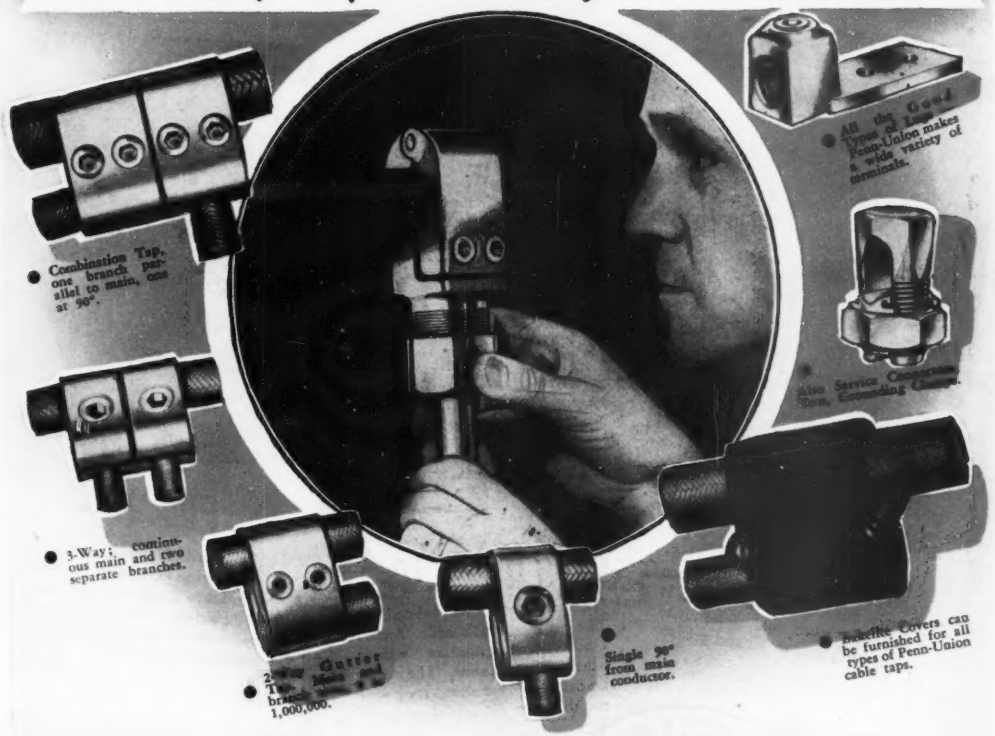
SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

ENTRANCE BUSHINGS

PENN-UNION ELECTRIC CORPORATION, ERIE, PA.

# *It's easy to pick the right* CABLE TAP-


Combination Tap, one branch parallel to main, one at 90°.
3-Way; continuous main and two separate branches.
Single tap from main conductor.
All the Good Types of Penn-Union makes a wide variety of terminals.
Bakelite Covers can be furnished for all types of Penn-Union cable taps.

# *from the Complete line*

You'll find the widest variety of parallel and 90° taps, combinations, and gutter taps—in a range of sizes up to 1,000,000 cm. Insulating Bakelite covers can be furnished for all types.

Also a complete line of Service Connectors, Terminals, Tees, Straight and Parallel Connectors, Grounding Connectors, etc. — every good type of conductor fitting. And every one is thoroughly tested — *dependable.*

***Sold by Leading Wholesalers***

## PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

**Canada: Dominion Cutout Company, Ltd.**
**250 Richmond St. West, Toronto**

THE *Complete* LINE OF CONDUCTOR FITTINGS

# PENN-UNION

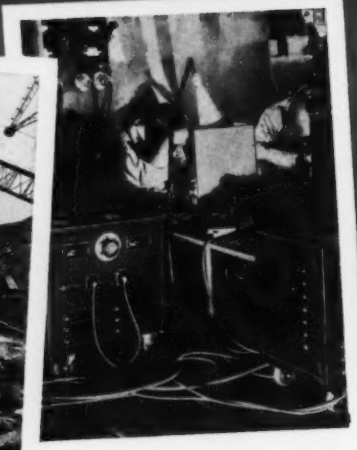
# Look what you can do

## Soak it in Acid Water

It won't penetrate the live Neoprene cover. This jacket does more than keep water out; it will not swell and deteriorate when exposed to oil and grease.

## Drag it over rock–

The tough cover will take abuse like an elephant's hide. Amerclad cables are famous for their abrasion resistance. They can be dragged over sharp rock and rough floors without damage.



## Flex it–

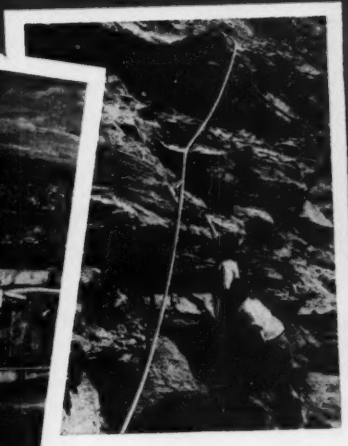
Amerclad Welding cables are made from extra-fine strands to eliminate strain on the operator's wrists. This also allows the cable to be easily snaked into restricted quarters.

AMERICAN STEEL & WIRE COMPANY
USS TRADE MARKS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

# with AMERCLAD:

## Reel it in or out-

Mine operators like the way Amerclad stands up under the continuous reeling necessary on so many mine machines. Here, the cable is reeled in and out—all day long—on a minimum diameter pulley.



## Expose it to sunshine-

Amerclad cables are designed to give top service even when exposed to sunshine, ozone, oil or grease. This chemical protection, combined with the mechanical strength of Amerclad, assures you of long life even under the most punishing conditions.

## Hang it over cliffs-

Amerclad has the strength to resist abrasion. Even though it sways in the wind and grinds against rock particles, the tough Neoprene jacket will bounce back for more.

**WRITE FOR INFORMATION.** There is an Amerclad cable or cord to meet your exact needs. Amerclad cables are designed for specific uses on portable machinery, tools, motor and generator leads, welders, machine tools, appliances, mining machinery—wherever you need a heavy-duty cable that will give long life and freedom from trouble.

*Get in touch with your nearest AS&W office or write: American Steel & Wire Company, Rockefeller Building, Cleveland 13, O.*

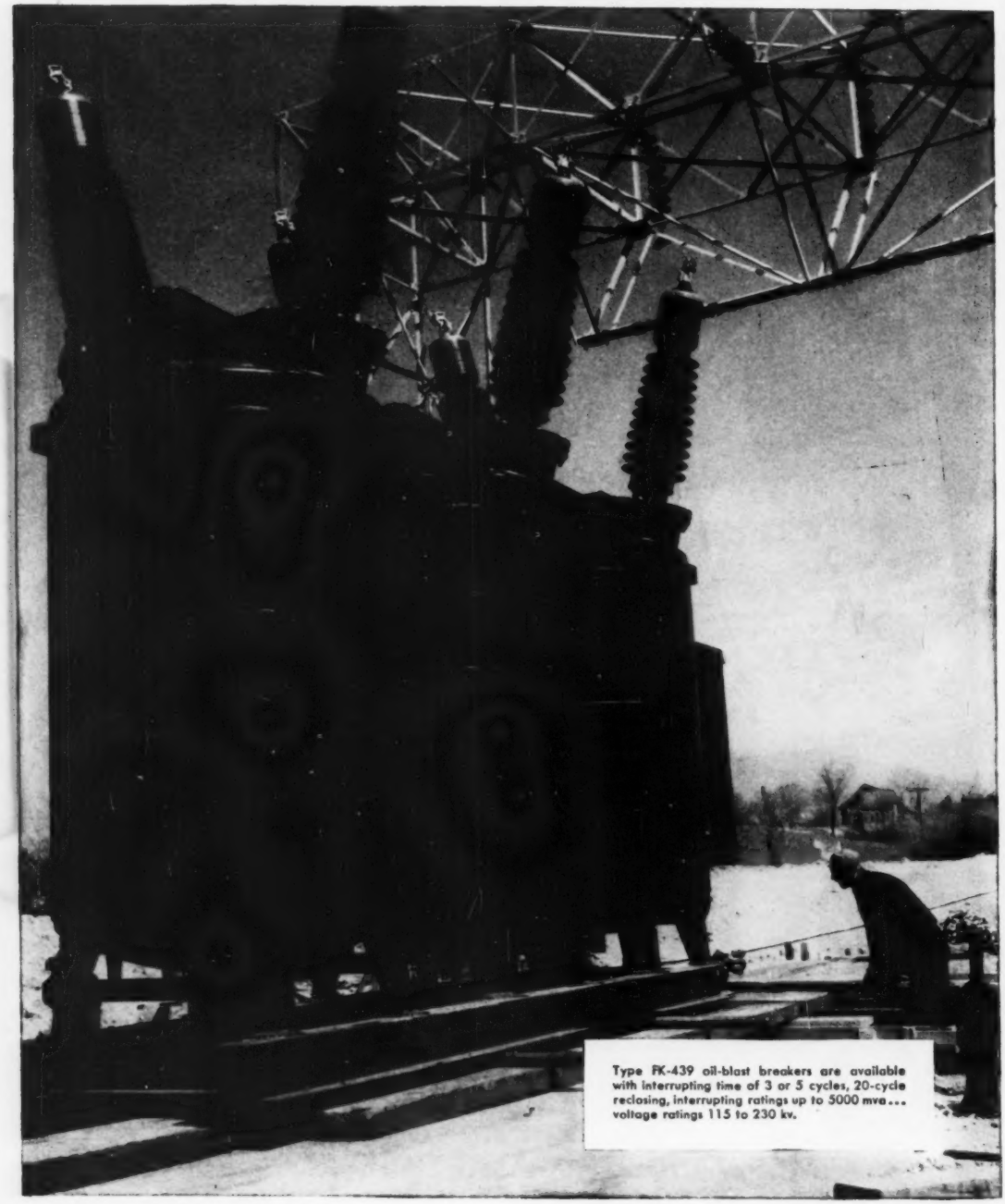
AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO • COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

# American Electrical Wire and Cable

UNITED STATES STEEL

# Central Hudson Gas and Electric



Type FK-439 oil-blast breakers are available with interrupting time of 3 or 5 cycles, 20-cycle reclosing, interrupting ratings up to 5000 mva... voltage ratings 115 to 230 kv.

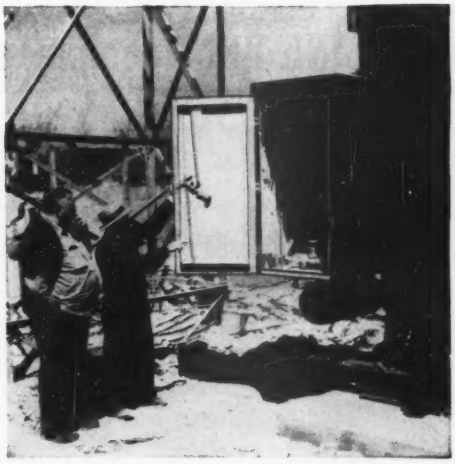
# adds 33,000 kva of capacity

## Type FK-439 oil-blast breakers protect new 110-kv system

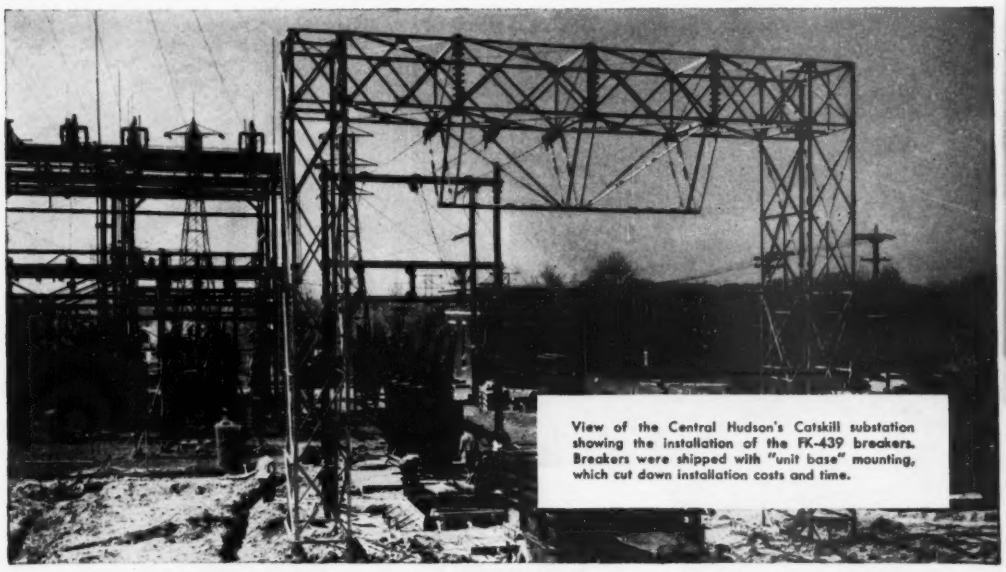
Recently Central Hudson Gas and Electric Corporation embarked on an expansion program to add 33,000 kva of capacity to its Catskill substation. Since plans called for changing high-line voltage from 66-kv to 110-kv, new circuit breaker equipment was necessary.

Company officials chose G-E Type FK-439 oil-blast breakers to protect the new installation. Multi-break interrupters and a dependable pneumatic operating mechanism provide high-speed performance and operating economy. Completely sealed bushings and accessibility of all internal parts simplify inspection and maintenance. Breakers were shipped with "unit base" mounting, which cut down installation time and expense.

Investigate these and the many other economic advantages to be realized when you use G-E switchgear on your system. Ask your G-E sales representative for further information on the FK-439 breaker, or write for Bulletin GEA-4407B, General Electric Company, Schenectady 5, N. Y.



Pneumatic operating mechanism is easily accessible. All working parts have an adequate margin of strength for safety and durability. Thoroughly tested and proved, built for dependable performance and operating economy.



View of the Central Hudson's Catskill substation showing the installation of the FK-439 breakers. Breakers were shipped with "unit base" mounting, which cut down installation costs and time.

GENERAL ELECTRIC

859-13

# Emptying a few gondola cars a day... or a few thousand a week?

## LINK-BELT equipment does either job... better

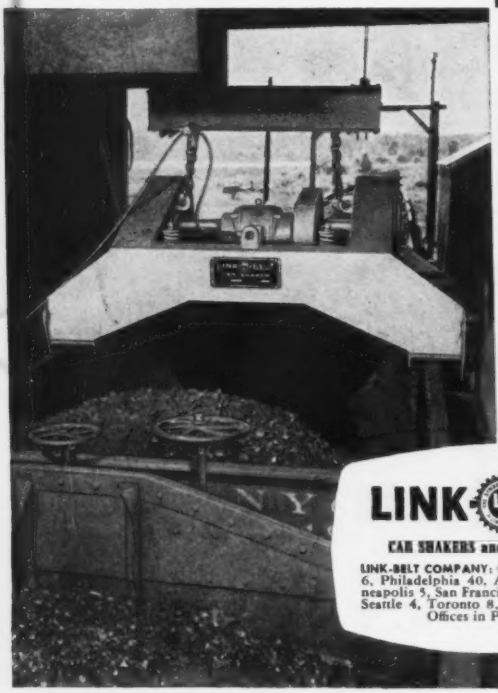
**Get an unbiased recommendation for the right type of railroad car unloader for your needs**

Be sure you get the right railroad car unloader for your particular requirements. Only Link-Belt builds both types — the Rotary Dumper for large users ... the low-frequency Car Shaker for smaller operations.

You'll save time and manpower with either. For both are precision-engineered by Link-Belt to do a specific job faster ... more gently ... at lower cost to you.

**It's easier on cars** ... thanks to exclusive low-frequency vibration. And the Link-Belt Car Shaker also has a much lower noise level. Positive action gets most hopper bottom cars "broom-clean" in a few minutes. Especially good for damp, sticky materials. Write for Book 2345.

**Unloads gondolas in 90 seconds** or less (including return to upright position)! Simple, automatic, fool-proof — Link-Belt Rotary Car Dumper can be operated by unskilled labor. Takes all types of open top cars — any length, width or height ... up to 90-ton capacity. Book 2048-A has complete data.



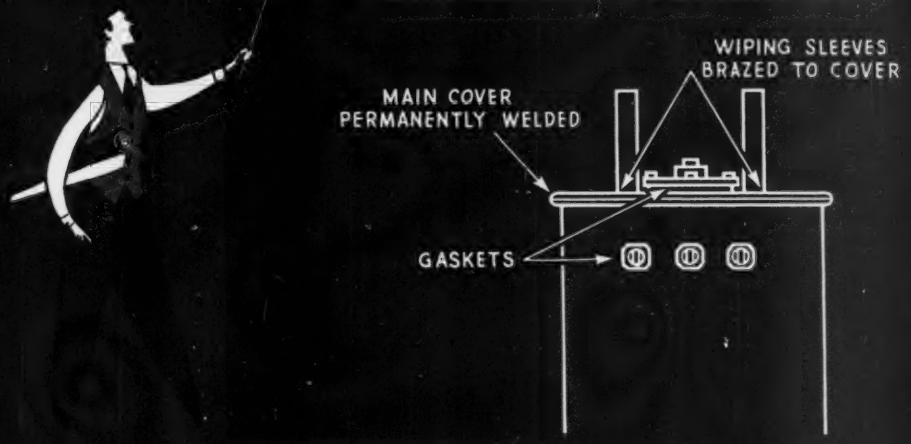
LINK-BELT

CAR SHAKERS and ROTARY DUMPERS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 12.351

# IT'S A FACT:

## SEALED CONSTRUCTION MAKES KUHLMAN SUBWAY TRANSFORMERS COMPLETELY SUBMERSIBLE

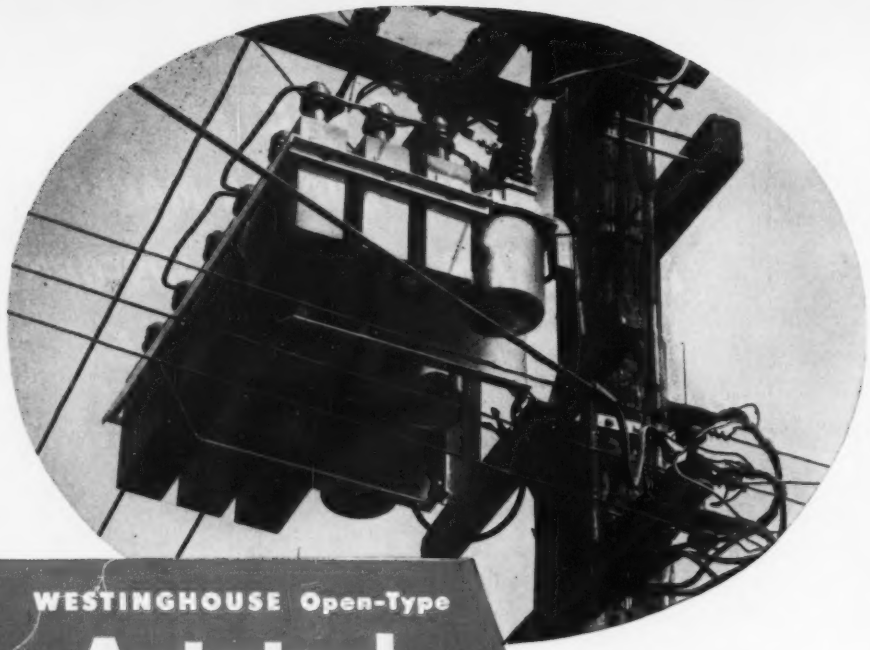



Sealed construction of the new Kuhlman Subway Transformer designs provide complete protection against the entrance of water and the corrosion of metal parts. This is an important item since these units are often completely submerged.

Covers are permanently welded to tank rim (bolted covers can be furnished at customer's option). Wiping sleeves are brazed to cover or terminal box. Moisture resistant gaskets are used for handhole covers, terminal box covers and secondary bushings. Tap changer outlets are protected by plugs. Cooling tubes, when used, are fitted snugly into holes in the tank wall and welded on the outside to insure strong water and oil tight joints and to eliminate moisture-holding crevices. A copper faced grounding pad is welded to the tank base.

These features, plus other important design changes including reduced cross-section for smaller manholes, conform to the recently announced EEI-NEMA Standards for subway transformers. Write for Bulletin CS-901, listing complete details on the new Kuhlman subway units.

K E



**WESTINGHOUSE Open-Type**

# Autotrol

## The automatically switched capacitor equipment that costs you less than $6.00 per kvar

Here's complete, lightweight, automatically switched capacitor equipment for pole crossarm mounting. Costing less than $6.00 per kvar—Westinghouse Open-Type Autotrols* answer your need for low-cost unit equipment for power-factor improvement at any location on your system. And look at the features you get when you specify Autotrols:

**High rating . . .** 225 and 300 kvar, 2400 volts delta to 13,800 volts wye.

**High-Capacity Switch . . .** Type CSO-1 oil switches provide sufficient current capacity to switch from 600 kvar at 2400 volts up to 1800 kvar 3-phase capacity at 13,800 volts.

**A complete Unit . . .** Individual capacitor units, switches, and terminal caps, assembled, connected, and shipped as a complete package.

**Simple, flexible installations . . .** merely complete line and control connections and the equipment is in service. Kilovar adjustment can be made by varying the number and size of the capacitor units.

**Performance-proved capacitors . . .** the Autotrol is equipped with standard distribution-type Inerteen® capacitors featuring solder-sealed bushings and zinc spray, weatherproof finish.

For complete information on Westinghouse Autotrols ask your Westinghouse Representative for SA-6812, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60771

YOU CAN BE SURE...IF IT'S
Westinghouse
CAPACITORS

*T.M.

# for ACCURATE, RELIABLE and SIMPLE MEASUREMENTS of INSULATION RESISTANCE

**★ Generators, Motors and Transformers ★ Single Conductors, Cables and Capacitors ★ Changes in Volume Resistivity with Temperature and Humidity ★ Paper Capacitors ★ Dielectric Absorption in Insulation of Electrical Machinery ★ Long Sections of High-Voltage Cable ★ Slabs of Insulating Material ★ Multi-Wire Cables ★ Taking Charge-Current Curves Over Time Intervals from One Second to Many Hours**

The G-R Type 544-B Megohm Bridge is ideal for all of these measurements. Fundamentally it is a Wheatstone bridge with a very sensitive vacuum-tube voltmeter balance-indicating circuit which absorbs negligible amounts of power.

Over the range from 100,000 ohms to 10,000 megohms the effective scale-length is 35 inches! The accuracy of measurement varies from ±3% from 0.1 megohm to 100 megohms, to ±10% from 1,000 megohms to 10,000 megohms.

Two power supplies are available: an a-c unit delivering d-c test voltages of 500 volts and 100 volts to the bridge, and a battery-supply model of 90 volts. The voltage applied to the unknown is very close to constant, regardless of the value of the unknown resistance.

**Type 544-B Megohm Bridge for A-C power supply.....$340 for battery supply.....$250**

GENERAL RADIO Co.

275 Massachusetts Avenue, Cambridge 39, Mass

NEW YORK 6 · CHICAGO 5 · LOS ANGELES 38

*For Detailed Information write for this Informative Booklet*

Name_____ A

Street_____

City_____ Zone_____ State_____

**Type EFU**—First and still finest Explosion-Proof Fluorescent Lighting Fixture. Available for two 40 Watt, 48" lamps or two 100 Watt, 60" lamps. Pat. No. 2,393,202

**Industrialite High Mounting Fixture**—For railroad yards, steel mills, round houses—any industrial plant calling for a ruggedly built, high-mounted lighting fixture.

# BETTER LIGHT *for* BIGGER PRODUCTION

**Stocklite**—Provides perfect illumination for shelves and bins in stock rooms.

**RLM Standard Dome Fixture**—Reflector made of rust-resisting iron and finished with three coats of baked porcelain enamel. Sectionalized construction permits easy installation, convenient servicing.

Fewer rejections . . . greater safety . . . better employee relations . . . increased efficiency to meet defense demands—these are the immediate returns on an investment in good industrial lighting.

Appleton Industrial Lighting Equipment is precision-designed to provide *good light*—the right light, without uncomfortable glare, troublesome contrast or shadow. Expert engineering, unequalled manufacturing facilities and nearly a half century of experience are combined in each Appleton fixture to provide maximum efficiency at minimum installation, service and operating expense.

Appleton Lighting Fixtures are made to suit every industrial requirement—including hazardous locations—whether indoors or out. For the finest illuminating equipment or expert assistance on any lighting problem, contact Appleton—Standard for Better Lighting.

## APPLETON INDUSTRIAL LIGHTING

*Sold Through Electrical Wholesalers*

**APPLETON ELECTRIC COMPANY**

**1705 Wellington Avenue • Chicago 13, Illinois**

**Branch Offices:** NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM, 429 Brown-Marx Bldg. MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant St. BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street CINCINNATI, 626 Broadway • HOUSTON, 717 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9.

**Resident Representatives:** Binghamton, Dallas, Indianapolis, Kansas City, Orlando, Milwaukee, New Orleans, Seattle, Portland, Ore.

**Export Representatives:** International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

MALLEABLE IRON CONDUIT FITTINGS

**APPLETON**

OUTLET BOXES AND SWITCH BOXES

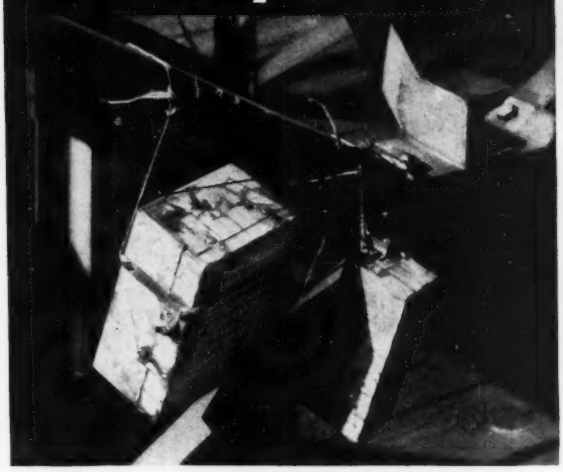
**ELECTRIC**

INDUSTRIAL LIGHTING EQUIPMENT

**PRODUCTS**

EXPLOSION-PROOF FITTINGS AND BOXES

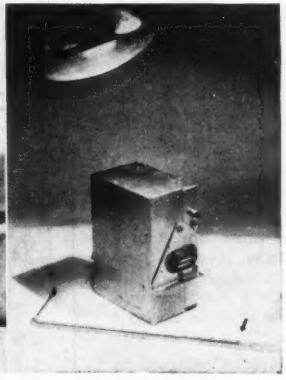
# Motorola 2-way radio



**Weather Exposure**

After eleven months of exposure, through one of the toughest winters on record, the two Permakay units (photographed on the roof of Motorola plant) showed no significant change in selectivity characteristic.

Thermometer reads —30° centigrade as the Permakay selectivity reading remains same as before this extreme cold test was started



In laboratory torture tests Permakay goes through blistering +90° centigrade test without effect on selectivity readings.

## Motorola first with Sealed-Unit Selectivity

**In the exclusive *Sensicon* design of the Motorola *Permakay* wave filter, 15 nuisance tuning adustments are removed and permanent selectivity is guaranteed for the life of the set!**

More tuned circuits and superior performance with *fewer* tuning adjustments in the SENSICON Receiver are achieved by using the PERMAKAY IF Wave Filter. The modified constant-K, m-derived band pass filter contains 15 tuned circuits . . . BUT . . . you are not burdened with field alignment and complex tuning adjustments. The filter, tuned and sealed during manufacture, requires no further adjustments . . . *ever*. This combination provides over 100 db signal rejection at the *edge* of the adjacent channel while providing a broad band-pass at 6 db for full modulation deviation acceptance.

Motorola's unique Permakay system of linear phase shift adjustment solves the problem of reflection and pulse noise control to provide maximum signal-to-noise ratio for the phenomenally high interference-rejection.

The PERMAKAY Filter characteristics are made permanent by casting the entire unit in a solid block of polyester-styrene plastic. Never can the precisely tuned circuitry be affected by water, dirt, heat, cold or mechanical shock. Temperature compensation insures constant performance even at extreme temperatures as demonstrated in all rigid laboratory torture tests. Motorola's *unconditional* guarantee of the PERMAKAY Filter for the life of the set again demonstrates that Motorola is still your best investment.

**Over 22 Years of Leadership in Mobile Radio . . .**

Year in and year out, Motorola installations number more than *twice* those of all other manufacturers *combined* and more than *five times* those of the nearest competitor.

**Motorola**

*Communication and Electronics Division*
4545 Augusta Blvd., Chicago 51, Illinois

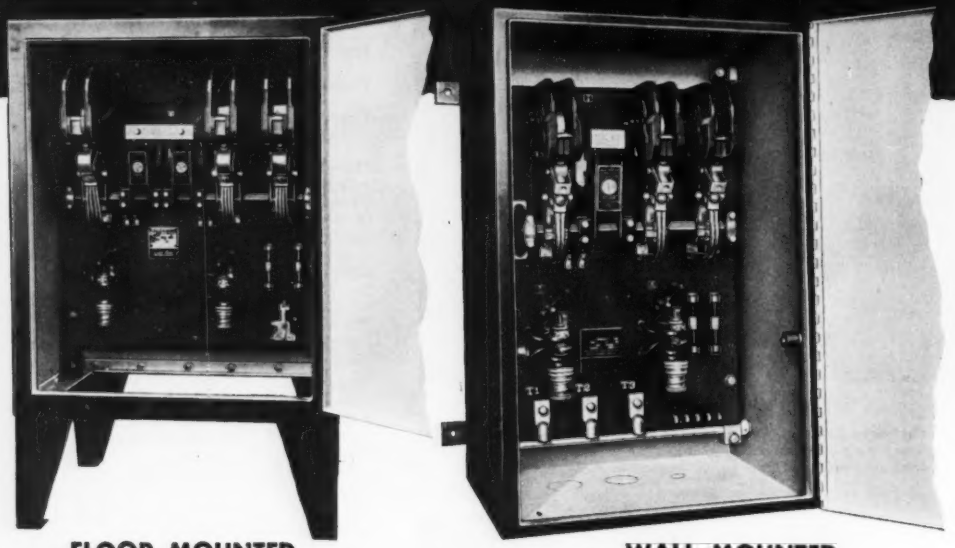
DUST AND HEAT-PROOF

WATER AND COLD-PROOF

TAMPER AND SHOCK-PROOF

**Motorola 2-way radio**

# EC&M Heavy-duty Motor Starters* *Pay Off* on essential drives



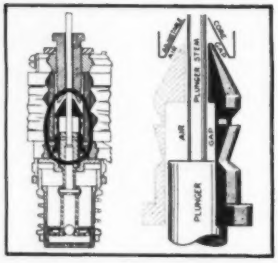
**FLOOR MOUNTED** **WALL MOUNTED**

## *You Save MORE when you give Plant Management Continuity of Service*

For pumps, compressors, conveyors and similar drives essential to a plant's over-all production, keep in mind the qualities of EC&M Motor Starters that help speed output.

EC&M's magnetic Overload Relays give dual protection. They trip *instantly* on heavy overloads and provide inverse time-element trip to safeguard motors under all conditions. A magnetic balance absorbs starting currents and permits a low current-setting for running protection. These relays use silicone dashpot fluid.

Combined with EC&M's well-known *LINE-ARC* Contactor to open and close the motor circuit, these starters are unequalled for industry's important drives.




Special Iron Sleeve with tapered wall thickness provides non-creeping relay permitting low current-setting.

***For low voltage---550 volts or less.**

***For COMPLETE FACTS, ask for Bulletins 1067 and 1180-2.***

**THE ELECTRIC CONTROLLER & MFG. CO.**
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

SIMPLEX-ANHYDREX CABLES STAY ON THE JOB IN WET LOCATIONS

# Here's Proof

## IN TEST FIGURES

Continuous testing to rigid standards proves without doubt that Anhydrex insulation will not absorb more than 20 mg. of water per square inch of exposed surface. Rarely does the figure climb that high. After one day's immersion in water at 70°C. (158°F.) Anhydrex has a dielectric constant that will not exceed 3.2. Its increase in capacitance between one and eight days' immersion at 70°C. will not exceed 3.5% for insulation thicknesses greater than 4/64", or 5% for thicknesses of 4/64" and less.

## IN SERVICE RECORDS

Reports from the field, which indicate that no ANHYDREX Cable has ever failed due to water absorption, include this account: An eastern city known for its bad water conditions installed nearly 10,000 ft. of ANHYDREX Cable in its municipal signal and communications systems. During ten years' service the cables had no trouble whatsoever, although ducts and manholes there are nearly always full of water and metallic cables used in the same installations had proved inadequate. ANHYDREX Cable that was buried directly in the ground came through with the same trouble-free service, and portions of cables exposed above earth suffered no deterioration.

---

Neoprene-jacketed ANHYDREX Cables need no additional coverings. They cut down weight, diameter and cost. You can use them underground, overhead, or in ducts without fear of water and moisture, soil acids and alkalies and weathering. Specify them with confidence for transmission and distribution systems, signal and communication circuits, street, airport and park lighting.

SIMPLEX ANHYDREX

SIMPLEX WIRE & CABLE CO. 79 SIDNEY ST. CAMBRIDGE 39, MASS

# *Nothing stands up like MICA under* ●●●

**MOISTURE and OIL PENETRATION**

*and*

EXTREMES OF HEAT AND COLD

HIGH SPEED AND FRICTION

AGE AND OVERLOAD

*when you think of MICA . . . think of MACALLEN*

**MACALLEN MICA**

*ALL FORMS, ALL QUANTITIES — ALL DEPENDABLE*

**THE MACALLEN COMPANY**

16 MACALLEN STREET • BOSTON 27, MASS.

CHICAGO: 565 W. WASHINGTON BLVD. • CLEVELAND: 1231 SUPERIOR AVE.

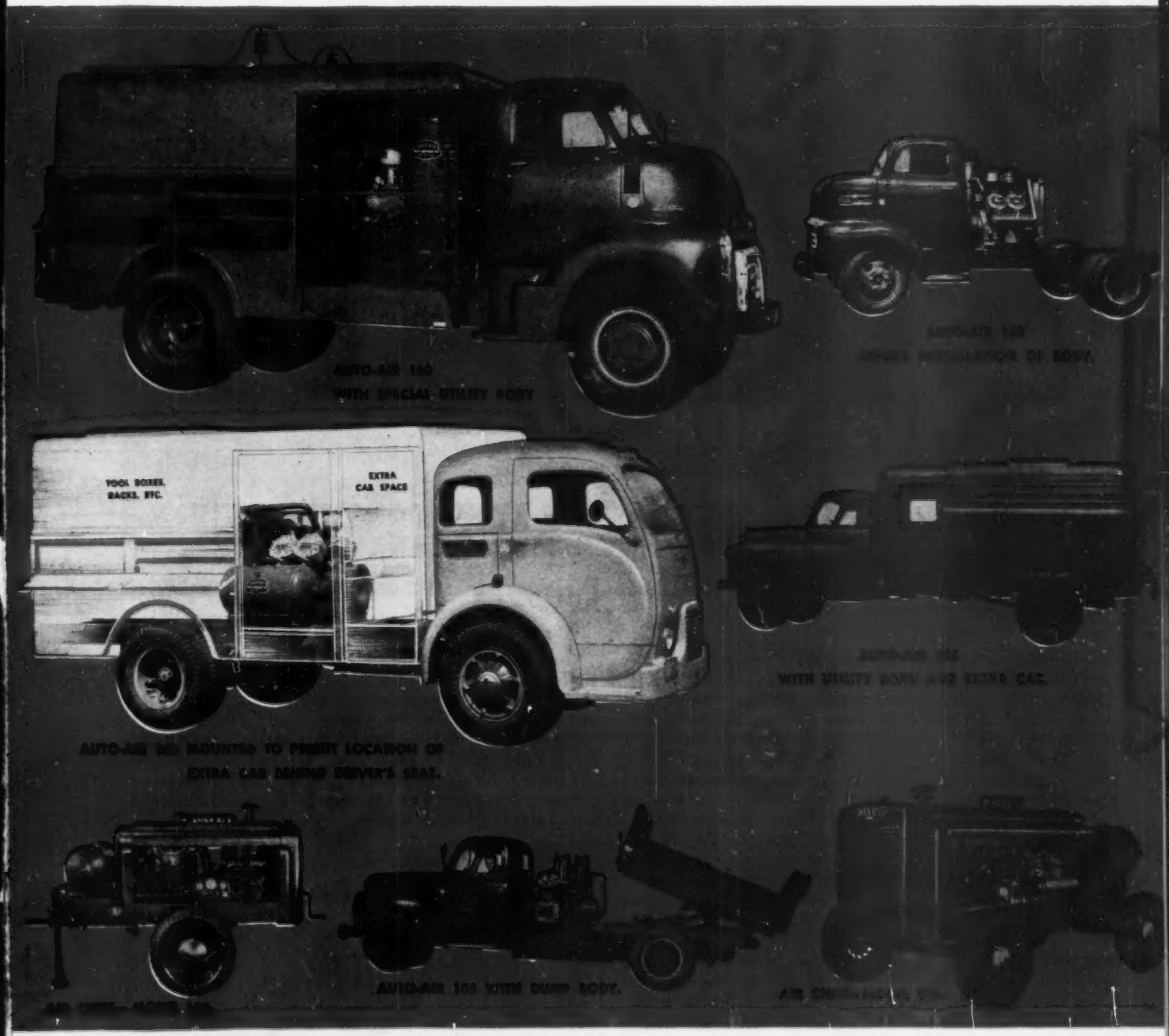
# There's a Davey for every compressor need of every utility!

● Regardless of the nature of your compressed air requirements, you can specify Davey and be sure you will receive the utmost in efficient service and dependability.

Davey Auto-Airs are ideal for most utility applications. (Davey has more Auto-Airs in utility service than all other manufacturers combined.) Driven directly from the truck engine, through the Davey Heavy Duty Power Take-off, an Auto-Air occupies only one-third of the truck body space . . . leaves the remainder open for transportation of men, tools, materials. Auto-Airs are available in 60–105–160–210–315 c.f.m. capacities. They can be mounted on most standard trucks . . . with any type of truck body.

For applications requiring trailer compressors, Davey manufactures 2-wheel Air Chief portables in 60–105–160 c.f.m. sizes and 4-wheel trailers in 105–160–210–315 c.f.m. units.

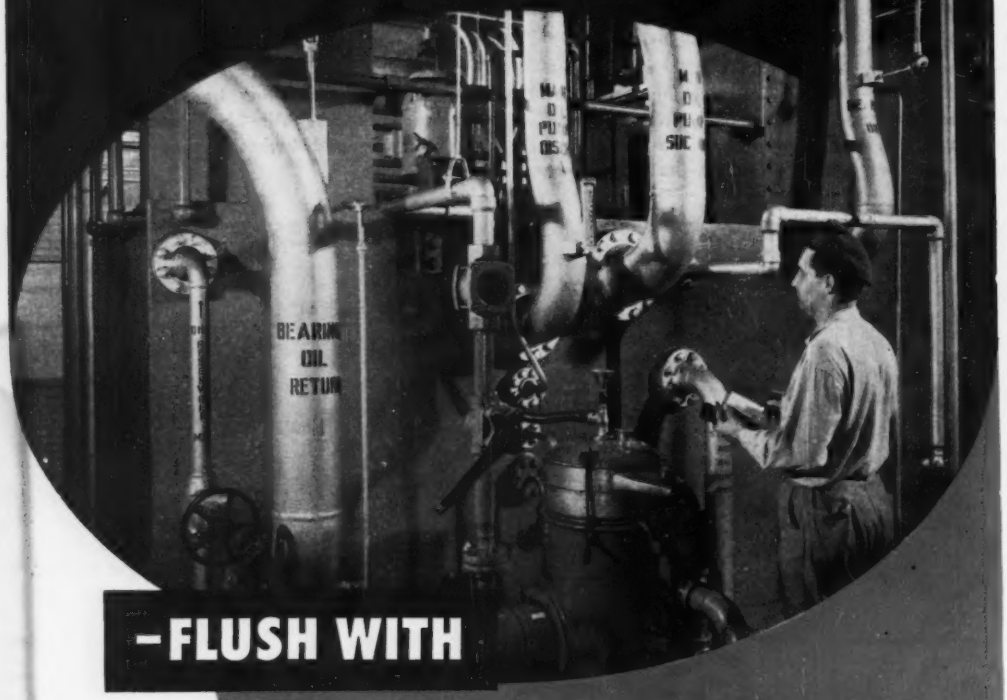
A-3464




DAVEY

**DAVEY COMPRESSOR CO.**
KENT, OHIO

# Make sure your new turbine has a clean lubricating system




## —FLUSH WITH GULF TURBINE FLUSHING OIL

The surest way to clean the lubricating system of your new turbine thoroughly is to flush with Gulf Turbine Flushing Oil. It has excellent flushing action on welding scale, chips, sand, and other loose foreign matter. It is also very effective in removing grease-type slushing compounds, which may have a harmful effect on the lubricating oil. And you make sure that inaccessible parts of the system are clean.

Because Gulf Turbine Flushing Oil has been fortified to provide an effective rust preventive film, all oil bathed surfaces in the system get complete protection against rust during the time between flushing and initial filling.

An important advantage of Gulf Turbine Flushing Oil over other types, such as certain solvents, is that the undrained portion in the turbine systems does not impair the lubricating value of the turbine oil. For Gulf Turbine Flushing Oil is itself a satisfactory lubricant.

Only one-third to one-half of a normal turbine oil fill is required for thorough flushing. Thus the expense of flushing your new turbine with low-cost Gulf Turbine Flushing Oil is nominal.

Gulf Turbine Flushing Oil is equally effective for units already in service. In these it helps remove harmful sludge and organic acids—helps flush out deposits which may have collected in the system.

For complete information on this quality product and for recommended procedure for cleaning your turbine, call in a Gulf Lubrication Engineer. Write, wire, or phone today. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh 30, Pennsylvania.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

# Here is the world's most faulted power system!

This system begins and ends inside our High Power Laboratory. It owns only a few hundred feet of conductors, yet it has been faulted almost 250,000 times—deliberately!

It gets this purposeful punishment because it was erected specifically to serve *you* . . .

For into this miniature system of ours we connect every new interrupting device design. Here they are repeatedly subjected to all fault currents they might be expected to interrupt in actual service. And out of this testing comes the valuable data that enable us to prove . . . and to constantly improve . . . the equipment we build for you.

The testing of high-power circuit breakers provides a good example. The data gained from thousands of actual faults—proving ratings as high as 10,000,000 kva for 230,000 volts—have enabled us to reduce interrupting time, and the size of equipment to do the job. For *you* this means greater system stability and better service continuity. Most important, it means . . . you can always be *sure* when you specify Westinghouse.

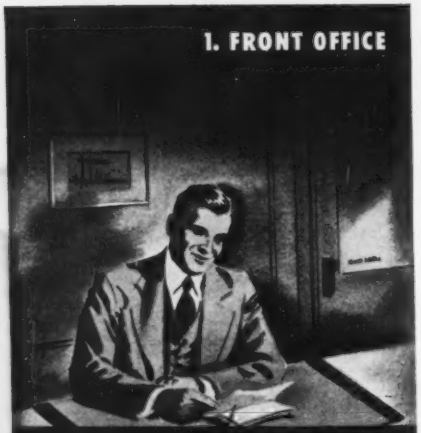
**High Power Laboratory Developments**

"De-ion®" Grid Interrupters
10,000,000-kva Interrupting Capacity
3 and 5 Cycle Interrupting Time
Reclosing Times as Low as 15 Cycles
Longer Contact Life
Smaller Tanks—Less Oil

**SEE "ELECTRICAL PROVING GROUND".** *The complete story of 25 years of High-Power Laboratory testing is available to you in sound and color motion picture. Here is an absorbing record of electrical progress . . . dramatic evidence of the way Westinghouse proves for you. For a showing to your group, simply contact your Westinghouse representative or write Westinghouse Electric Corporation, Film Division, P. O. Box 868, Pittsburgh 30, Pennsylvania.* J-60749

YOU CAN BE SURE . . . IF IT'S
Westinghouse
CIRCUIT BREAKERS
WITH "DE-ION" GRIDS

# TWO WAYS Reynolds ACSR SAVES You Money



## 1. COSTS LESS THAN OTHER TYPE CABLE

## 2. LIGHTER WEIGHT MEANS LOWER INSTALLATION COSTS

FRONT OFFICE can count their savings the moment they sign an order for Reynolds ACSR. Its first cost is considerably less than other types of cable . . . and aluminum's light weight adds further savings through lower transportation costs.

When Reynolds ACSR hits the field there's *more* good news. Aluminum's light weight makes for easier, faster stringing. Higher strength of ACSR permits a longer distance between poles—eliminating up to 4 poles per mile. Or, because the sag of ACSR is less than that for other types of cable, shorter poles or supporting towers can be used.

**FREE . . .** ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION CHARTS AND TABLES. Please request on your business letterhead.

**NOW . . .** 4 Reynolds Master Reels do the work of 100 wooden reels! Handle ACSR quicker and more economically. Eliminate reel inventory and exchange. Cut down on handling, storing, record-keeping as well as reducing damage cost to a minimum. Reynolds Master Reels and Coils are easily assembled by linemen right on the job . . . are sturdier than wooden reels.

**For complete information**

see your Reynolds distributors listed below or write direct to Reynolds Metals Company, 2584 South Third Street, Louisville 1, Ky.

Westinghouse Electric Supply Co., New York, New York (And branches) • North Coast Electric Co., Seattle, Washington • Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS METALS

# REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

# SOLVED— "LIKE MAGIC!" with R&IE

## SUBSTATION KNOW-HOW

Special structure arrangements such as shown here are everyday problems with R&IE designers. For over thirty years R&IE has set the pace in solving the simple or complex substation structure requirements.

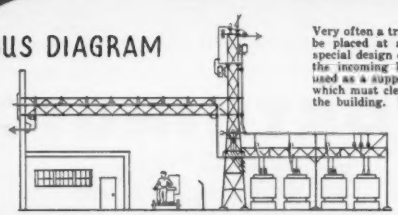
R&IE Unified Responsibility means that your job is easier to order, to check, to change if necessary. "Under one Roof" R&IE controls all fabrication, equipment assembly and shipping—which means that your station is coordinated and meets your requirements.

*The Check List*

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- PEN OR ENCLOSED ISOLATED PHASE EAVY DUTY BUSES
- RK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- ETAL CUBICLES
- STING DEVICES

CHECK the FACTS

BUS DIAGRAM



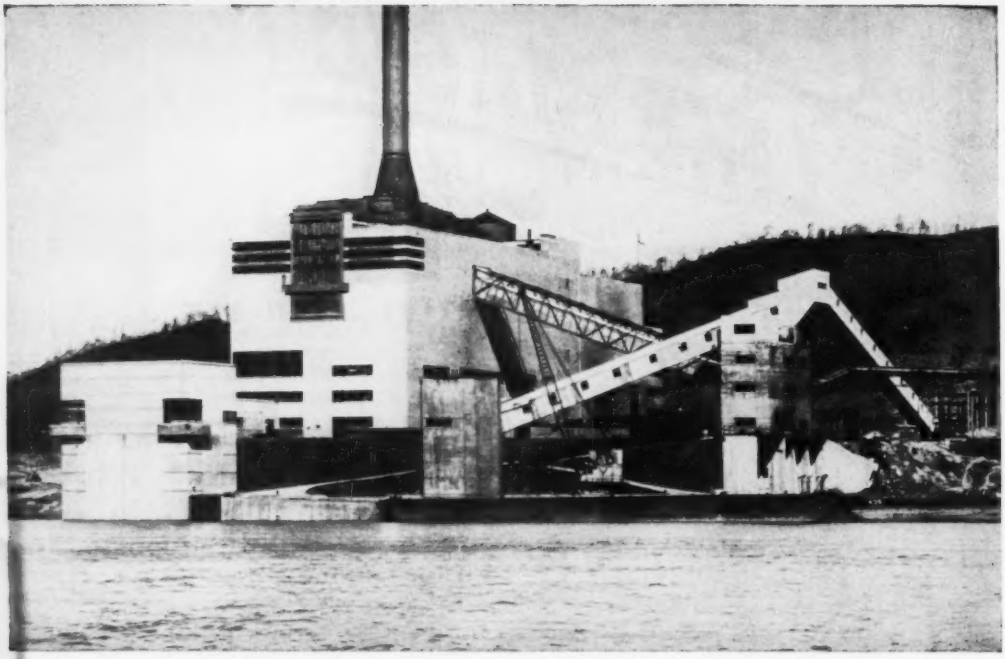
Very often a transformer and bus rack must be placed at a location which requires a special design of structure. Note here that the incoming line and air-switch tower is used as a support for the elevated bus rack which must clear a traffic aisle and part of the building. The transformer bus had to be located on the other side of the incoming line tower. This is one of the many custom-built sub-station jobs which are "SOLVED—like MAGIC" by R&IE Engineers.

RAILWAY and INDUSTRIAL ENGINEERING CO. Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

AN I-T-E SUBSIDIARY

FROM THE LAYOUT TO THE LINE — R&IE SUBSTATION SERVICE IS CONTROLLED AT ONE SOURCE



# Unique Circulating Water System Installed in This Power Plant

The R. E. Burger steam-electric plant of Ohio Edison Company is located on the Ohio River well above flood stage—which may reach as much as 60 feet above extreme low water. Water is supplied to the condensers by a patented circulating water system pioneered jointly by Worthington and the consulting engineer, Mr. George W. Saathoff.

All major equipment except circulating pumps, which are designed to operate completely submerged if necessary, are located above flood stage.

The new installation of a Worthington 70,000 sq ft two-pass condenser and auxiliaries, serving a 90,000 kw turbine-generator, is the third Worthington unit in this station. Two 46,000 sq ft condensers were previously installed.

For advice on any new installation or information on a wide range of power plant equipment, consult Worthington Pump and Machinery Corporation, Steam Power Division, Harrison, New Jersey.

### HOW IT WORKS

Two full-capacity circulating pumps are used in series.* The primary pump, submerged below extreme low water, is a Worthington motor-driven HIFLO. Its high starting head characteristic is able to deliver enough water for starting purposes. A booster pump—a single-suction volute Worthington MIXFLO, mounted directly upon an hydraulic turbine—starts when there is enough water in the control well. The two pumps then operate automatically in series at full capacity.

Advantage is taken of maximum siphon effect from the condenser drop leg which enters the sealing or control well. From this well, all circulating water is passed through the hydraulic turbine. Thus the static head from sealing well to river level is utilized—75-80% being recovered—in reducing the work of the primary pump, with saving in overall pumping power.

The booster pump functions until rising water renders the turbine ineffective. Then the primary HIFLO works alone, producing full capacity under reduced head.

*In the new unit, there are two half-capacity primary pumps, permitting operation of only one in the winter when low water temperatures prevail.

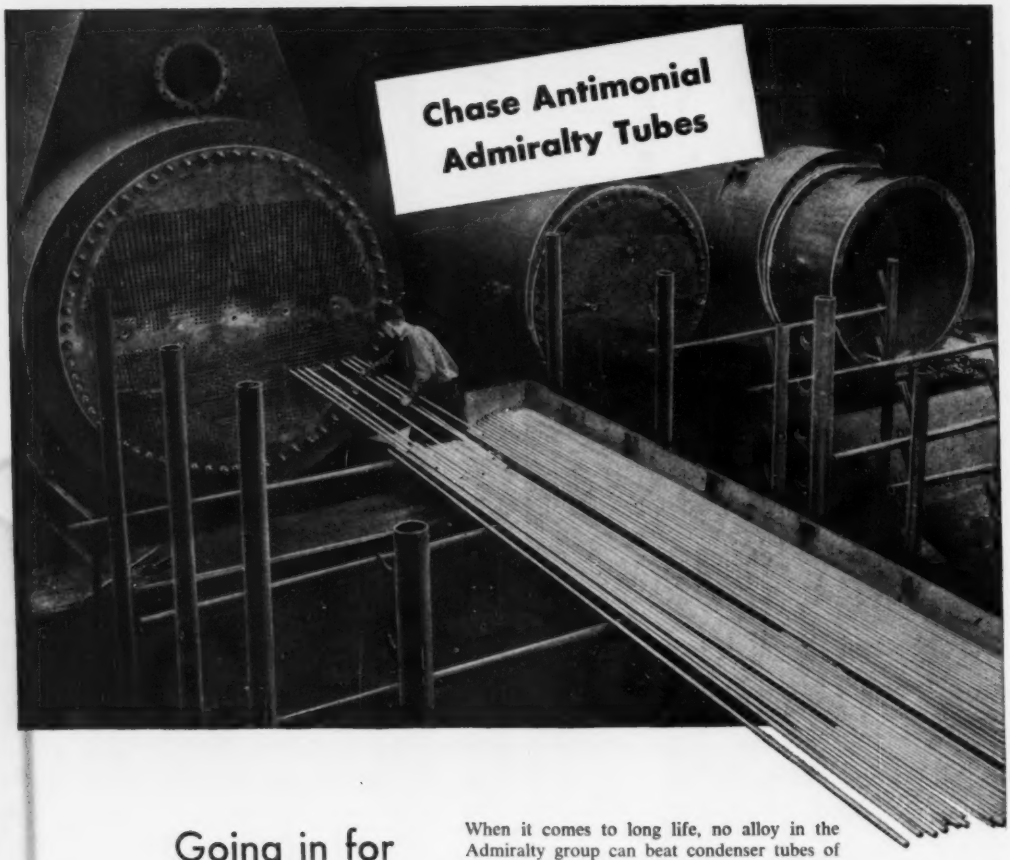
Z.1.1

**WORTHINGTON**

**WORLD'S BROADEST LINE OF STEAM POWER PLANT AUXILIARIES**

| | | |
|---|---|---|
| Feed Water Heaters | Boiler Feed Pumps | Steam Turbines |
| Steam-Jet Ejectors | Water Treating Equipment | Surface Condensers |

Spang-Central's Big 4 Conduit family—"Cenlaco"..."Central Black"..."Central White"...and "Central EMT"—provides you with a complete catalog of conduit to fit any requirements. Dependable Spang-Central Conduit is sold through prominent recognized distributors.




## Going in for years of service

When it comes to long life, no alloy in the Admiralty group can beat condenser tubes of Chase Antimonial Admiralty.*

Because these tubes have *enough* antimony, they resist dezincification. And antimony as an inhibitor doesn't affect the grain structure . . . will not weaken the tube.

For more information about long-lasting Chase Antimonial Admiralty . . . send coupon for FREE book on Condenser and Heat Exchanger Tubes.

**CHASE WAREHOUSE STOCKS:** *NEW YORK, BALTIMORE, NEW ORLEANS, LOS ANGELES.* Also carried by *Vinson Supply Co., Tulsa; Standard Brass & Mfg. Co., Houston.*

*U.S. Pat. No. 2,061,921

**FREE CHASE BOOK** discusses corrosion problems and selection of condenser and heat exchanger tubes for all applications.

**Chase Brass & Copper Co., Dept. EW 1151A**
**Waterbury 20, Conn.**

*Please send me your Free Book on Condenser and Heat Exchanger Tubes.*

**Name**_____

**Position**_____

**Firm**_____

**Street**_____

**City**_____ **State**_____

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

CHASE 75th ANNIVERSARY 1876 1951

# DIAMOND
# SOOT BLOWERS

## Meet the challenge of

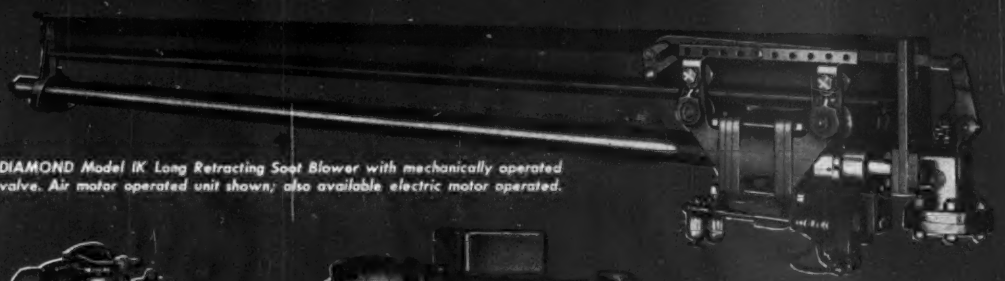
## HIGH BOILER AVAILABILITY

The greater emphasis being placed on high boiler availability indicates the equal importance of high soot blower availability. The first can be limited by the second.

No other power plant equipment takes the "beating" to which soot blowers are daily subjected. Elements are exposed to repeated, sudden and severe thermal shock . . . to extremes of temperature, erosion and corrosion.

Diamond has long paid particular attention to "high availability" in its research . . . in the design, in the selection of materials and in the manufacture of all Diamond Soot Blowers. That they excel in this direction also is attested by their performance records . . . and by the preference they have long enjoyed among the most critical users of boiler equipment. The next time you need soot blowers, it will pay you well to select Diamond Soot Blowers.

**DIAMOND POWER SPECIALTY CORP.**
LANCASTER, OHIO
*Diamond Specialty Limited · Windsor, Ontario*



*DIAMOND Model IK Long Retracting Soot Blower with mechanically operated valve. Air motor operated unit shown; also available electric motor operated.*

*DIAMOND Model G98 Soot Blower. Air operation shown; also available for manual or electric operation.*

*DIAMOND Model IR Short Retracting Soot Blower. Electric operation shown; also available for manual or air operation.*

*DIAMOND Model A2E Automatic Air Puff Soot Blower.*

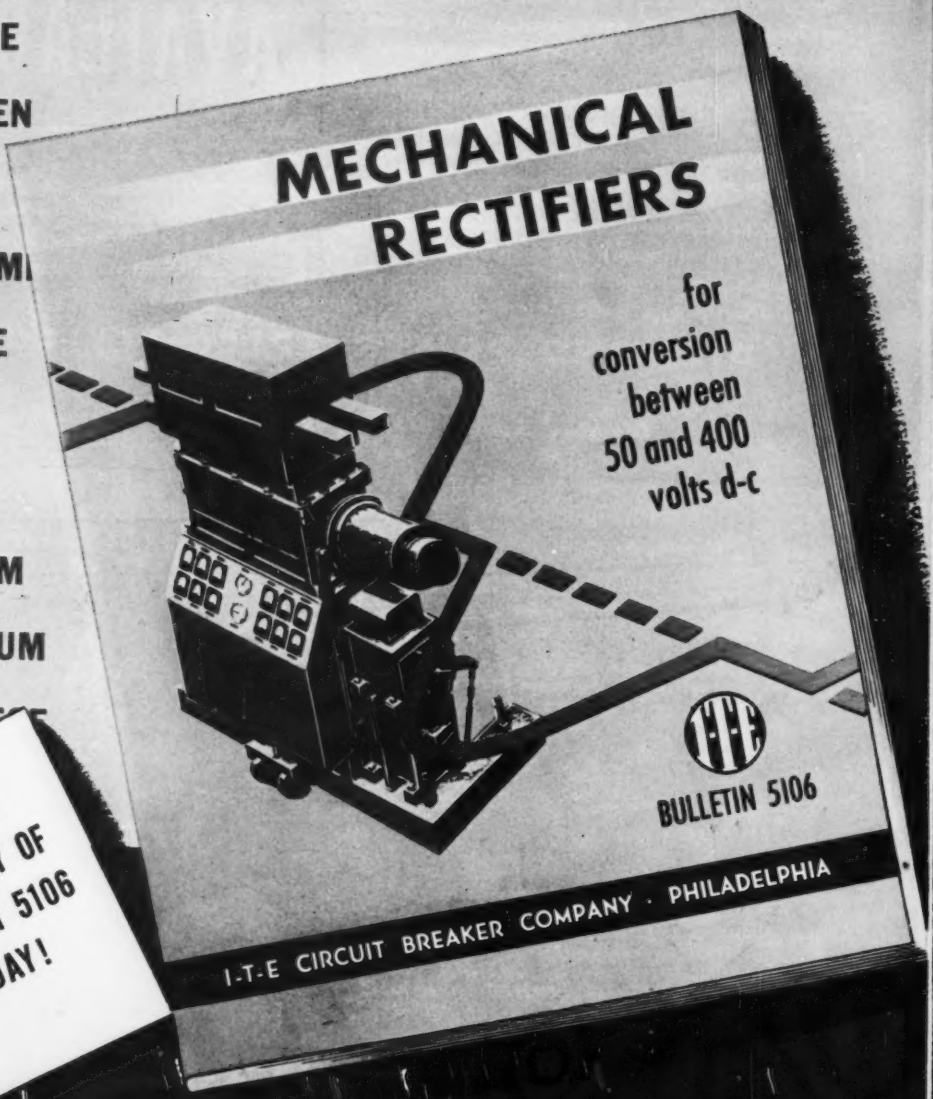
*There is a DIAMOND Soot Blower . . . for Every Boiler Cleaning Requirement*

CHEMICAL PROCESS INDUSTRIES:

# Here's Your Guide to

For The Electrolytic Production of:

- CHLORINE
- HYDROGEN
- OXYGEN
- SODIUM M
- FLUORINE
- COPPER
- ZINC
- ALUMINUM
- MAGNESIUM
- MANGANE




SEND FOR YOUR COPY OF BULLETIN 5106 TODAY!

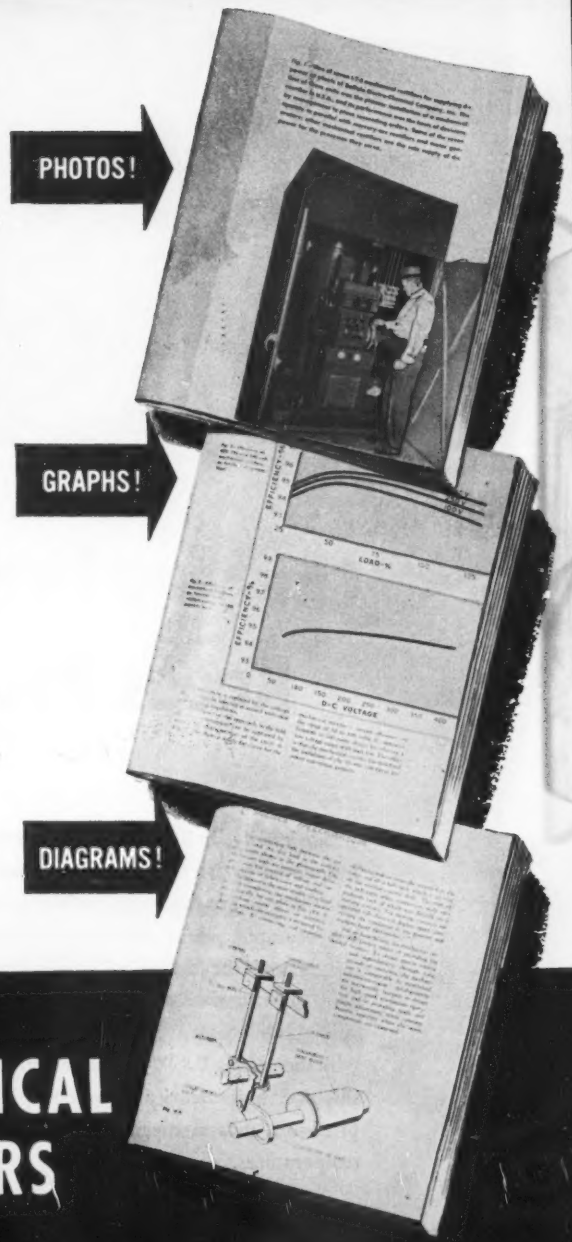
# More Efficient Power Conversion

How you can get *95 to 97 per cent rectifying efficiency* for electrolytic production of chemicals at 3000 amperes and up is told in I-T-E Bulletin 5106.

Here is the story of the I-T-E Mechanical Rectifier—how it offers you direct current at lower cost; how its efficiency and economies in installation, operation and maintenance will save you money all along the line. Now you can plan your cell layout the way you want it—and get all the advantages of using low d-c voltages—greater safety to personnel—lower leakage losses to ground.

This comprehensive 32-page bulletin is packed with informative charts, diagrams and illustrations explaining the Mechanical Rectifier's operation.

Bulletin 5106 is yours for the asking. Send for it today. I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.




I-T-E

## MECHANICAL RECTIFIERS

Contour plot of high velocity thermocouple gas temperature measurements taken in an 800,000 lb. per hour unit.

Contour plot of high velocity thermocouple gas temperature measurements taken in a unit operating at 522,000 lb. steam per hour.

# Charting Furnace Fever Keeps Power Costs Down

**Traditionally, boiler design is an art. As influenced by B&W research, it more and more nearly approaches a positive science. For example, where rules of thumb once determined the design of boiler surface area, now accurate empirical data is available from MHVT research, carried out with the unique B&W-developed multiple-shielded high-velocity thermocouple for precision measurement of furnace gas temperatures.**

**During several years' intense research, B&W's "MHVT gang" charted the furnace temperatures of nearly a hundred boilers . . . discovering troublesome hot spots . . . determining optimum heat transfer rates under widely varying conditions of service . . . providing B&W engineers with a wealth of design data that assures the highly efficient, trouble-free operation of B&W units. As a direct result of this pioneering work both boiler *size* and boiler**

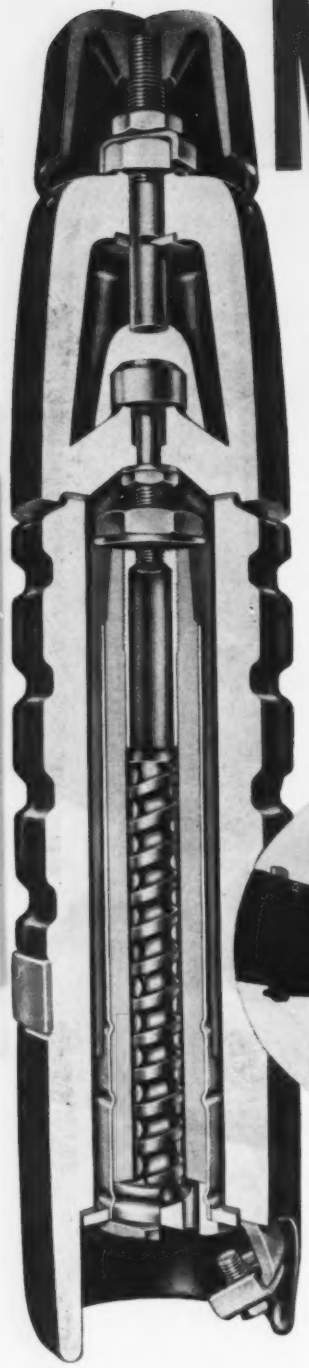
***maintenance*** are kept to the minimum consistent with slagging characteristics of the fuels burned.

It's this sort of creative research approach to boiler engineering that has identified B&W with steam-power progress for more than 80 years . . . and may well be a source of new steam-generating economies in working out *your* present problems or future plans.

BABCOCK & WILCOX

***Helping industry cut steam costs since 1867***

G-4911



# New Arrester

## Westinghouse Type LX provides 20,000 amperes ...highest short circuit capacity available today!

Here's a completely new expulsion-type arrester that brings you the kind of protection you've been looking for. Note how these features contribute to more positive protection . . . longer arrester life.

**Highly current limiting**—a longer arc path over a spiral course limits follow current flow through the arrester to a fraction of available fault current.

**High surge discharge capacity**—well over NEMA requirement of 65,000 amperes.

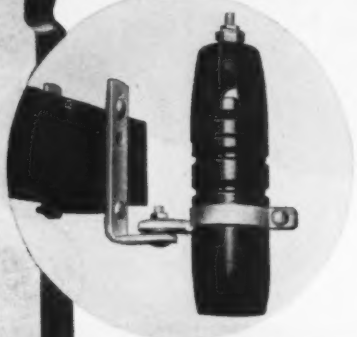
**Low and consistent sparkover**—skillful design has produced a gap of considerable length which sparks over at very low value.

**Low IR drop**—since the arc drop is the only voltage that appears across the arrester during the flow of surge current, the discharge voltage is inherently low.

**Operating elements totally enclosed**—available with enclosed isolating gap (as shown) or with external isolating gap at bottom. With polyethylene cap (slight extra cost), fully enclosed type has no exposed metal parts at line, ground or intermediate potential. Cap pushes on; no metal springs, no turning necessary.

**Easy voltage identification**—each ring on main porcelain body indicates 3 kv of rating. For example, cutaway arrester pictured is 9 kv, arrester in inset is 3 kv.

**Longer life**—limitation of power follow current insures exceptionally long arrester life.



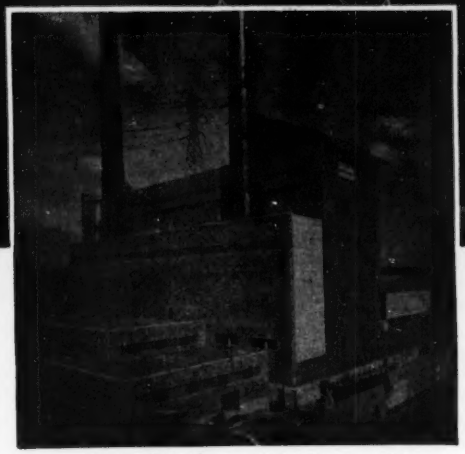
Descriptive Bulletin 38-150 explains how this revolutionary new LX design brings you these matchless benefits. Ask your Westinghouse representative for a copy or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60764

◀ 3-kv, Type-LX, "De-ion®" Expulsion Lightning Arrester with crossarm mounting bracket. This arrester has a short-circuit rating of 20,000 amperes. Ratings range from 3 to 15 kv.

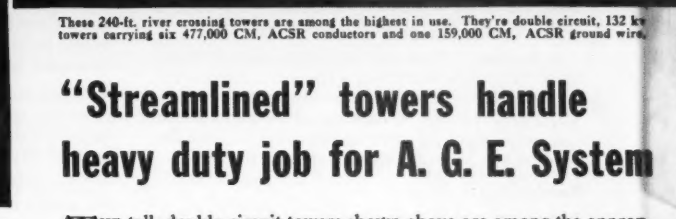
YOU CAN BE SURE...IF IT'S Westinghouse

LIGHTNING ARRESTERS

# A new "high" in tower dependability and economy



American Bridge Company fabricated and erected the structural steelwork for the new Philip Sporn Plant, which utilizes four of the largest steam generators in the country.



These 240-ft. river crossing towers are among the highest in use. They're double circuit, 132 kv towers carrying six 477,000 CM, ACSR conductors and one 159,000 CM, ACSR ground wire.

## "Streamlined" towers handle heavy duty job for A. G. E. System

THE tall, double-circuit towers shown above are among the approximately 160 erected to join the new 550,000-kw Philip Sporn Plant at Graham Station, W. Va., to the 132 kv transmission network of the American Gas and Electric System.

Designed and fabricated by American Bridge Company, these steel towers stand as proof of the soundness of "streamlined" towers—stripped of all non-essentials—for even the heaviest duty. Equipped with steel grillage earth anchors, they offer the added economies of simplified installation and frill-free construction that resists wind and wintry weather.

American Bridge has been designing, fabricating and erecting transmission towers for the nation's leading power companies for forty-five years. Its experience and facilities are second to none. Why not submit any questions you might have to our nearest Contracting Office? An inquiry involves no obligation.

**AMERICAN BRIDGE COMPANY**

General Offices: Frick Building, Pittsburgh, Pa.

Contracting Offices in: AMBRIDGE · BALTIMORE · BOSTON · CHICAGO · CINCINNATI
CLEVELAND · DENVER · DETROIT · DULUTH · ELMIRA · GARY
MINNEAPOLIS · NEW YORK · PHILADELPHIA · PITTSBURGH
PORTLAND, ORE. · ST. LOUIS · SAN FRANCISCO · TRENTON
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

# AMERICAN BRIDGE

UNITED STATES STEEL

# "Our new International L-192 just played with the load!"

**This International L-192** with special utility body and winch recently went to work for People's Gas & Electric Co., Mason City, Iowa. Vehicle weight empty—15,000 pounds. Wheel Base — 175". 5-Speed transmission. Single-speed rear axle; Ratio: — 7.16 to 1.

**When the driver** of a new truck says: "It just *played* with the load," that statement *means* something.

In the case of this new International L-192, it meant "playing" with several 55-foot telephone poles and 4 *heavy* transformers the first day the truck was on the job. That's the kind of right-for-the-job performance you can expect from *every* International . . . from the smallest pick-up to the biggest model in the line.

**Here's why:**

**1.** Internationals are *heavy-duty engineered* to give you true truck stamina that keeps 'em running stronger, longer and at lower cost to you . . . no matter *what* job they have to do!

**2.** Internationals have the **COMFO-VISION CAB**—the *roomiest* on the road! Deep-cushioned seats, controlled heat and ventilation, *plus* perfect visibility through that big, one-piece Sweepsight windshield make this cab a driver's dream come true.

**3.** Internationals have new *valve-in-head engines*—proved and perfected in the world's largest all-truck engine plant to give you efficient balance of power, speed and economy.

**4.** Internationals are the world's most complete line of trucks, with 87 basic models and thousands of specialized variations, with Gross Vehicle Weights varying from 4,200 pounds all the way up to 90,000 pounds.

**5.** Internationals can be speedily serviced, because the International Truck you buy is backed by the world's largest, most complete, best equipped *exclusive* truck servicing system.

For the complete story see your nearest International Truck Dealer or Branch soon.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers

**International Harvester Company • Chicago**

# INTERNATIONAL TRUCKS

***"Standard of the Highway"***

## for faster underground installations

### New L-M Spacers

**New L-M Base Spacer:**

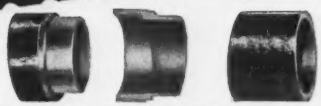
assures rigid foundation, desired gradient. Interlocking ends; wide flat base—the spacer will not tip over during or after installation. All L-M spacers come in standardized cartons to save stockroom handling and space. Available from stock, in six standard sizes.

**New L-M Intermediate Spacer:**

made of asphalt and asbestos fibre, highly resistant to acids and alkalis, fire resistant, Underwriters' listed. Withstands vertical flat crushing test of over 1200 pounds. Grooved ends lock together with the next spacer; centers notched for sawing.

**New L-M Bend Spacer Bar:**

a duct-installation leveller, used horizontally or vertically for accurate alignment of conduit around bends. Saves hours of work in lining up. Offers a tremendous saving in installation labor costs. L-M exclusive. 20" long, 1½" square, easily sawed to length.



**New L-M Multi-Use Bend Sections and Angle Couplings:**

use in any combination to make all kinds of special bends and crossovers. Male and female tapers offset 2½°, giving 5° bend in each section. Smooth inside, watertight tap-tite joints.

# The L-M System makes Fibre Conduit *so easy to use*

**New L-M Fibre Conduit Vise**

An easy, safe way to hold fibre conduit for sawing or tapering. For mounting on truck or bench, or with detachable tripod for use in the field, on the job.

With L-M Fibre Conduit and L-M equipment and tools, L-M's system speeds up underground installations, makes better jobs.

L-M Fibre Conduit is strong, light, tough; yet it's easy to taper and cut to length. L-M base spacers, intermediate spacers, and bend spacers assure a firm foundation and a rigid structure that won't settle or shift.

L-M tools save hours of time in the shop and on the job. Better get the low-down on this high-class, time-saving equipment.

**GET THIS FREE HANDBOOK!** Pocket-size manual covers recommended underground construction practices; contains valuable reference tables. Ask the L-M Field Engineer for a copy, also for new Fibre Conduit folder; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

**New L-M Tapering Tool**

Cuts a precise 2° taper on the end of conduit to assure tight, snug joints. Light; easy to use; saves time; cuts costs by salvaging cut ends and short lengths quickly.



**LINE MATERIAL... Fibre Conduit**

Complete Conduit and Equipment for Distribution (Poles)

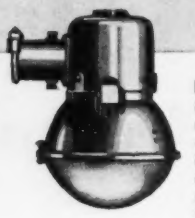
# *For every part of town...*

# L-M LUMINAIRES

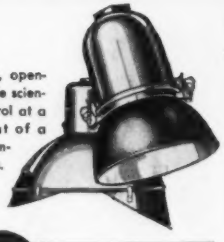
## make cities brighter, safer

**L-M Ovalite**—Mercury Vapor Unit. Newly developed optical system assures effective light utilization and good distribution on the street. Mercury vapor lamp is in horizontal position, high up in the reflector to minimize glare. Takes 11,000, 15,000 or 20,000 lumen lamp. Optional magnetic arc control feature keeps arc centered.

**L-M Spherolite** This famous L-M unit is widely known for its high efficiency, versatility, and many other desirable features. Takes up to 20,000 lumen mercury vapor or 10,000 lumen incandescent lamps.



**L-M Spherolite Jr.** For better neighborhood lighting at an economical neighborhood price. Interchangeable with Spherolite metal or porcelain heads, permitting low cost installation of the Junior and economical replacement later with the larger luminaire if traffic growth warrants. Has many of the Spherolite features, offers many light distribution patterns.



**L-M Directolites** Efficient, open-type luminaires that provide scientifically designed light control at a cost little more than that of a radial bowl. Available in symmetric or asymmetric types.

● L-M provides complete street lighting equipment for all sizes of communities and all kinds of neighborhoods. There are incandescent or mercury vapor units for white way lighting. There are smaller units for residential and outlying sections. A wide variety of reflectors, deflectors and glassware provides complete control for every recommended IES light distribution pattern.

Also available are standards, brackets and mast arms, transformers, control and service equipment.

L-M street lighting engineers have years of experience and L-M's engineering service can provide the answer to your street lighting application problem.

***WHICH OF THESE BULLETINS DO YOU WANT?***

- ☐ Spherolite
- ☐ Spherolite Jr.
- ☐ Street Lighting Standards
- ☐ Protective Lighting for industrial plants
- ☐ Directolite
- ☐ Controlite®
- ☐ Brackets, Mast Arms, Accessories
- ☐ Mercury Vapor Lighting Units
- ☐ Control Equipment

Ask the L-M Field Engineer for the information you want, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

65

*Ovalite, Spherolite, and Directolite are trademarks*

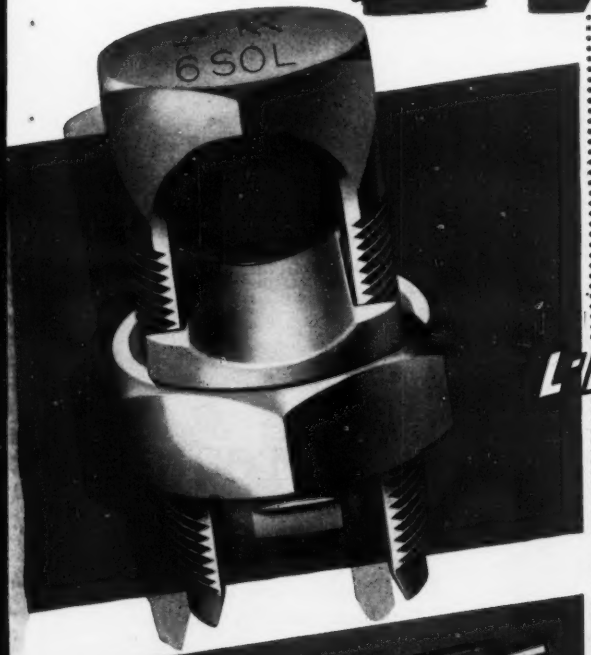
LM

**LINE MATERIAL**

*Street Lighting*

# How to make a good connection with L-M connectors

One of the best ways to make permanent, low-resistance connections is to select the best connector for the job. There are many connectors on the market; L-M offers a complete line, including some types not otherwise available. This page shows just a few. But for complete information, get in touch with the L-M Field Engineer, who can work with you on connector and splice problems. Call the nearest L-M Field Office. Or write for copy of our connector bulletin SC1. Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).




## L-M KYLE Split Bolt Connectors

Heavy-bodied Kyle connectors are machined from heavy stock. They have clean, accurately machined threads, smoothly rounded edges, close-fitting pad. The nut tightens easily, and the pad slides up smoothly to grip the wire solidly. There's little chance for distortion of these solid connectors, and they'll stand re-use—which makes them economical. For all wire sizes from No. 10 solid to a million circular mils. Available for copper, copperweld, aluminum, or galvanized iron wire. In several types, to assure minimum corrosion.

## L-M Fargo Automatic Line Splice

Here is a very fast, easy-to-use splice that just won't slip. In pull tests, the wire breaks before it slips out of the splice. You just stick the ends of the wire into the ends of the splice, give it a tug to set the clamps—and the job is done. No tools needed! Wire readily released so splice can be re-used. Widely used for permanent splices; superlative for emergency work. For solid or stranded copper or copperweld; *not suitable for galvanized iron;* for sizes from No. 8 to 500 MCM stranded.

## L-M Fargo Vise Type Connector

**Left:** An exclusive type with many advantages. One-piece construction, no parts to lose; always threaded; no time lost in starting the nut. An easy unit for linemen to handle and install. Bolts forged and rolled for extra strength. Develops approximately 10 pounds compression for every inch-pound of wrench torque. Binding action of vise-type construction gives a vibration-proof connection. High salvage value. Made of Everdur (bronze) for copper connections and plated Everdur for all-purpose use on copper, aluminum, or galvanized iron wire. Available for wire sizes No. 8 to 1000 MCM.

**Right, above: Fargo B-3 Lashing Wire Clamp:** hot-dip galvanized malleable iron. One-piece construction. Holds lashing wire to messenger to its full breaking strength. For any size lashing wire and for messengers up to and including ½ inch (25M stranding).

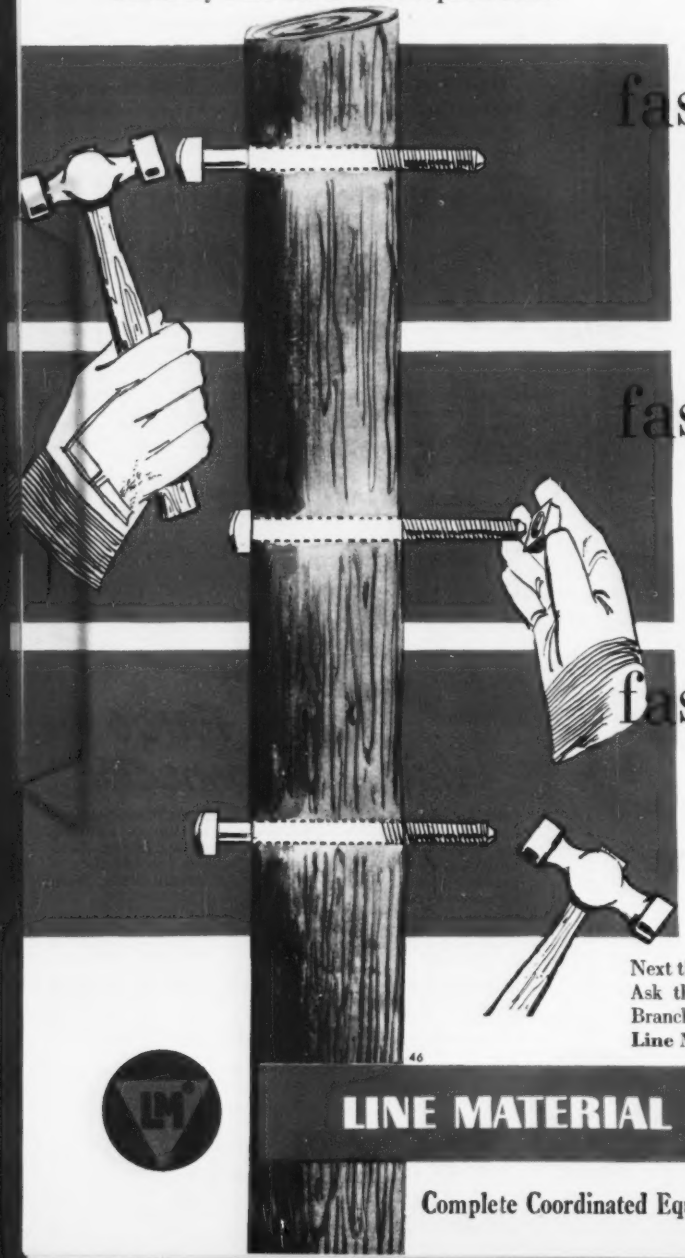
## LINE MATERIAL Connectors

**Complete Coordinated Equipment for Distribution Today**

You can speed up construction with

# L-M Buffer Point Bolts

Buffer Points are standard on all L-M Bolts 6" and longer, including carriage bolts, machine bolts and double arming machine bolts, eye, double arming, and thimble eye bolts and many other standard and special bolts.



## faster driving

tapered buffer point guides the bolt through the hole, with less friction

## faster threading

buffer point guides the nut right onto the thread—no fumbling, no lost time

## faster salvaging

hammering the point removes the bolt quickly—can't hurt the thread

Next time you order bolts, get L-M Buffer Point Bolts. Ask the L-M Field Engineer, call the nearest L-M Branch, or write, wire, or phone **Hardware Division, Line Material Company, Milwaukee 1, Wisconsin.**

46

**LINE MATERIAL Pole Line Hardware**

Complete Coordinated Equipment for All Distribution Requirements

# Quiet as a kitten

## ELIMINATE NOISE AND RADIO TROUBLES ON 24.9 GR.Y/14.4 KV SYSTEMS WITH THIS L-M ROUND-WOUND TRANSFORMER

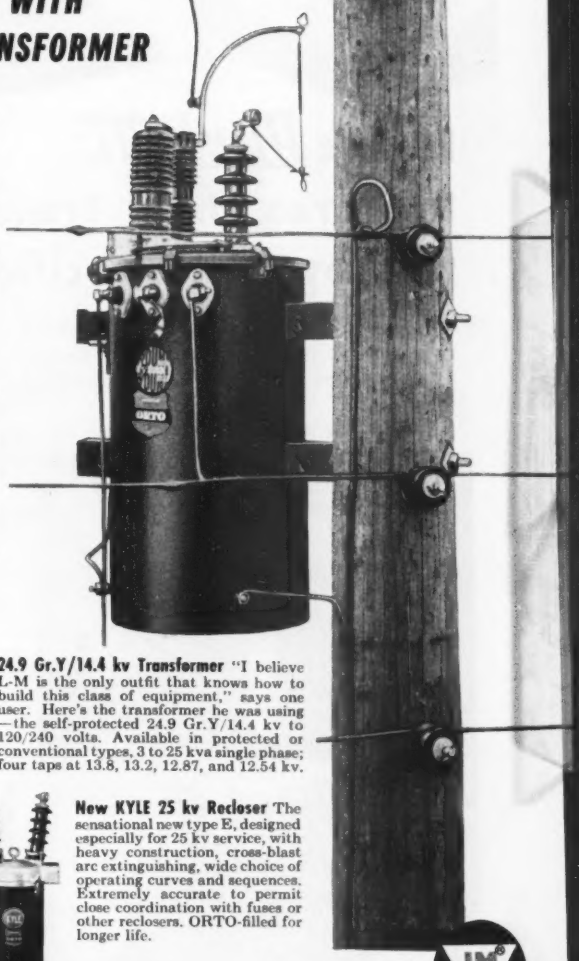
• Loose cores and leaky bushings can make lots of trouble on 24.9 Gr.Y systems. Some cores get loose and hum annoyingly. The radio noise from a poorly designed bushing can drown out a distant broadcasting station—which doesn't make the neighbors happy.

L-M has built a Round-Wound® transformer especially for this service—with a core that's quiet as a whisper—it is wound from continuous strip steel, and not cut; it stays quiet!

Oil-filled bushings are specially designed and processed—they give NO radio interference.

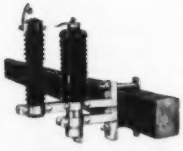
Like all Round-Wound transformers, this one has a high impulse level and high overload capacity.

The transformer and coordinated equipment have all been thoroughly tested in actual use in a number of locations throughout the country; they offer long life and dependable, economical service. Ask the L-M Field Engineer who calls on you for all the details; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).



**24.9 Gr.Y/14.4 kv Transformer** "I believe L-M is the only outfit that knows how to build this class of equipment," says one user. Here's the transformer he was using—the self-protected 24.9 Gr.Y/14.4 kv to 120/240 volts. Available in protected or conventional types, 3 to 25 kva single phase; four taps at 13.8, 13.2, 12.87, and 12.54 kv.

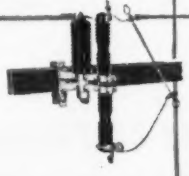
COMPLETE COORDINATED EQUIPMENT
FOR 24.9 GR.Y/14.4 KV SYSTEMS



**Heavy Duty Expulsion Arrester** Type PF-3, 18 kv with 65,000 amp surge capacity, gives dependable protection to transformer and system.

**New 24.9 Gr.Y/14.4 kv Cutout** Swivel type hanger; double entrance contacts permit fusing from either side. Silver-plated solid phosnic bronze spring and contact assembly—no steel core to nick and rust!

**New KYLE 25 kv Recloser** The sensational new type E, designed especially for 25 kv service, with heavy construction, cross-blast arc extinguishing, wide choice of operating curves and sequences. Extremely accurate to permit close coordination with fuses or other reclosers. ORTO-filled for longer life.



**Combination Arrester and Cutout** Choice of swivel hanger for crossarm mounting, shown here; or for transformer mounting (shown on transformer above), top can be rotated to assure vertical fuse mounting on any size or make transformer regardless of tank diameter.

49

LM®

**LINE MATERIAL**

*Transformers*

**Complete Coordinated Equipment for Distribution Today**

# HERE'S PROOF

**Summary of Portland General Electric Company's Report* on Purification of Transformer Oil**

"On a typical job of oil conditioning, the following information is given for a 7,500-kva, 60,000/2,400-volt water-cooled transformer with conservator type oil sec! . . . total oil in transformer, 2,000 gallons":

| | OIL CONDITION | |
|---|---|---|
| | *As Found* | *As Left, After Purification* |
| Neutralization No. (Acidity) | 0.70 | 0.06 |
| Interfacial Tension, dynes | 14.4 | 25.8 |
| Dielectric Strength, volts | 30,000 | 42,000 |
| General Classification | Bad | Good |

*Complete report was presented before the AIEE Pacific General Meeting in Portland, Oregon, August, 1951, by Mr. Delmar L. Brown, Superintendent, Testing Department, Portland General Electric Company.

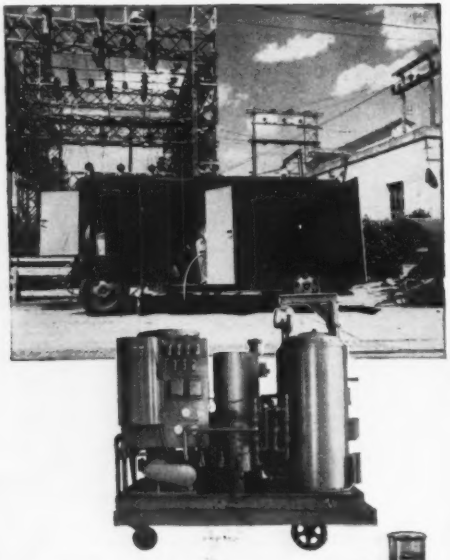
## Houdaille *Purivac*

## Restores Used Transformer Oil to New Oil Specifications

A Houdaille PURIVAC (shown below) was installed by Portland General Electric Company in a 4-wheel trailer equipped with a small testing laboratory.

Used to purify and test transformer oil in the field, Portland engineers reported to American Institute of Electrical Engineers that this "mobile refinery":

1. Restores used transformer oil to condition very nearly equivalent to new oil
2. Provides hot, super-dry oil for washing down transformer core and case
3. Does a good purification job without taking transformer out of service



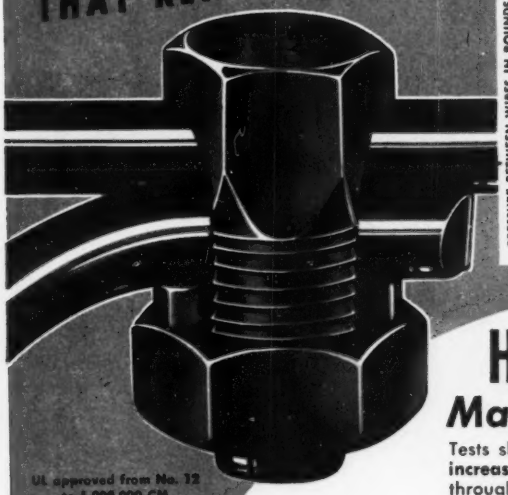
Portland General Electric Company's "Mobile Refinery" is built around Houdaille PURIVAC unit. The equipment is easily transported to any location.

**WRITE TODAY** for complete information and specifications on the Houdaille PURIVAC . . . the only portable unit that provides *complete, economical purification* of insulating oil for transformers, circuit breakers and other oil-filled electrical equipment. Equally efficient in the field or at a central station. *Designed and manufactured exclusively by*

**HONAN-CRANE CORPORATION**
819 WABASH AVE.
LEBANON, INDIANA
*A Subsidiary of*
**HOUDAILLE-HERSHEY CORPORATION**

# BLACKBURN *Hi-Strength* CONNECTORS

## MAKE HIGH PRESSURE Connections! THAT REALLY STAY TIGHT AND TROUBLE-FREE!



UL approved from No. 12 to 1,000,000 CM

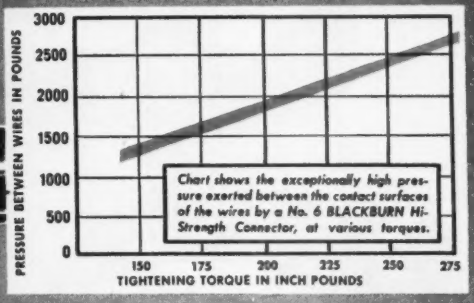



*Chart shows the exceptionally high pressure exerted between the contact surfaces of the wires by a No. 6 BLACKBURN Hi-Strength Connector, at various torques.*

## HIGH PRESSURE *Makes Better Connections*

Tests show that resistance **decreases** as contact pressure **increases.** Tests also show that high pressure will break through oxides and corrosion on the surface of the wire — particularly stranded wire — and make a better connection. And tests show that connectors which are capable of making high pressure connections definitely **stay tight** on the wires.

## BLACKBURN CONNECTORS MAKE LASTING HIGH PRESSURE CONNECTIONS BECAUSE:

1. They are made with the right combination of alloys — high strength alloys — to reduce frictional losses in the threads.
2. They are made with smooth-cut threads, to increase their efficiency. These two factors insure more of the tightening torque being converted to "pressure between wires."
3. Their corners and edges are all rounded, so that the high pressure cannot injure the wires.
4. They have that extra **strength** required to maintain the high "pressure between wires" without stretching and loosening.
5. The coefficient of expansion of the alloys used is substantially equal to that of copper. A temperature change of 100° F results in only 1% change in the "pressure between wires."

Yes, BLACKBURN Hi-Strength Connectors definitely make **better** connections — for your **protection!**

**JASPER BLACKBURN CORPORATION**
35 MADISON ST., ST. LOUIS 6, MO.
**Phone CEntral 3007**

SWITCHBOARD INSTRUMENTS
SOCKET INSTRUMENTS
D-C AMPERES
AMPERES
VOLTS-AMPERES
MILLIAMPERES
PANEL INSTRUMENTS
PORTABLE INSTRUMENTS
INSTRUMENT AUXILIARIES
RECORDING INSTRUMENTS

# The most complete line in the industry!

In the complete line of Westinghouse Electrical Instruments, you're sure to find the *right answer* to your measuring requirements. Moreover, you'll get a wider selection for specific applications, whether it be a-c or d-c current and voltage, single or polyphase circuits, watts or vars, frequency, power factor, synchroscopes, temperature indicators, ground detectors or position indicators.

For laboratories, production lines, power plants, field service, or military operations—whether the requirement is for recording or indicating—for portable or permanent application—Westinghouse Instruments give you lasting accuracy.

## Meets A. S. A. Performance Requirements

Every Westinghouse Instrument is built to meet the rigid performance requirements of the American Standards Association. No more exacting guarantee of an instrument can be made.

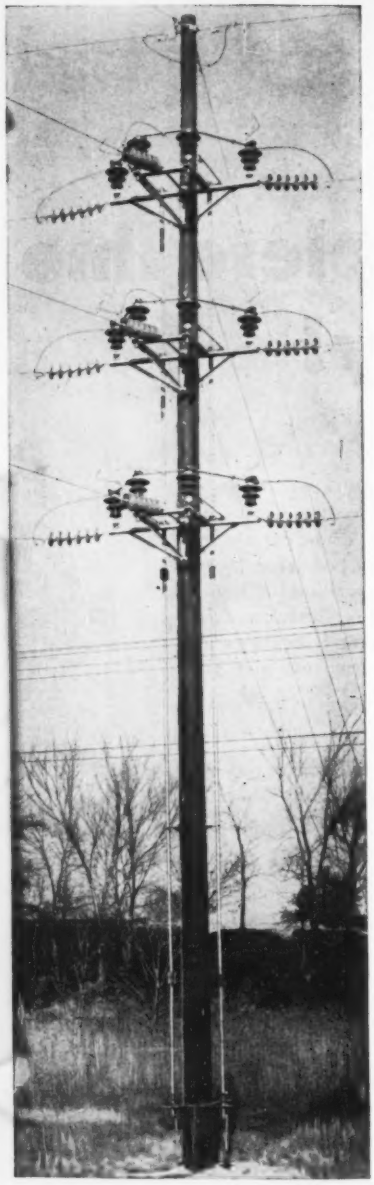
## Competent Application Assistance!

Westinghouse Instrument Application Engineers are available to help you in selecting and applying the proper instruments for your application. Simply call your nearest Westinghouse office.

For complete information on Westinghouse Instruments write for Booklet B-4696. Address: Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Pennsylvania. J-40406

YOU CAN BE SURE... IF IT'S Westinghouse

INSTRUMENTS



This Catalog 46KV600 GOABS Saved a Lot of Money for Iowa Power & Light Company.

*One Large User Wrote:*

"Because of its high interrupting ability,

# MATTHEWS GOABS

is particularly suitable for:

1. Sectionalizing or de-energizing long transmission or distribution lines. With GOABS, fewer switches are needed.

2. Isolating line sections in a looped system without service interruptions.

3. Transferring loads from one source to another, either manually, or automatically with motorized mechanism.

4. Interrupting transformer exciting current and/or load current.

5. Switching capacitor banks.

Because of its vertical phase spacing; the fact that no long arcs can form*; and one pole mounting, the GOABS is convenient and economical to install at any tap point, but particularly:

(a) Where land cost or space limitations make H-frame construction undesirable or impossible.

(b) Where a tap is to be made from a vertically-spaced circuit, such as one circuit of a double-circuit steel tower line. In this case, the GOABS could be mounted on a separate wood pole and tied to the tower with an insulated guy at each phase, making an inexpensive installation which is electrically and mechanically sound." (See photograph on next page.)

Matthews GOABS are now installed in 18 states and Puerto Rico and many repeat orders attest the fact they are not only giving the customers satisfaction but also saving them valuable line-crew time and also a minimum of 25% reduction in the installed cost of other kinds of switchgear offered for the same purpose.

*In charging current tests on 61.5 miles of 66 kv line arcs did not exceed 14 inches in length and were broken in 3 to 4½ cycles.

ALL 5 RATINGS NOW HAVE FULL APPROVAL
OF THE
TECHNICAL STANDARDS COMMITTEE OF R.E.A.

W. N. MATTHEWS CORPORATION
3850 DELOR STREET ST. LOUIS 16, MO.
ENGINEERS and MANUFACTURERS SINCE 1899

## UNIVERSITY OF FLORIDA
GAINESVILLE

*College of Engineering*
*Department of Electrical Engineering* July 25, 1951

"The recent charging current tests on

## CATALOG 69KV600 MATTHEWS GOABS

in which I collaborated with W. G. Parmenter of Georgia Power & Light Company suggests many uses of this equipment. It seems to me that the equipment might be used advantageously in the following applications:

Sectionalizing long transmission and distribution lines. The use of Matthews GOABS could reduce the number of sectionalizing switches required on long lines because of their ability to break charging currents as evidenced by the above mentioned tests wherein the switch broke the charging current on 61.5 miles of 69 kv. line. Inasmuch as the limit of the switch did not seem to be reached, it appears that charging current on lines of considerable more than 61.5 miles might be broken.* This may be verified by referring to test report and oscillograms and motion picture record of switch used in the test. It could be adapted as an isolating switch for manually switching from one source to another in case of trouble.

Due to similarity of charging current of lines and that of capacitor banks, this equipment might well be used for capacitor bank switching.

Since charging currents are considered more difficult to interrupt than inductive currents of similar value, the switch might well be used for transformer bank exciting currents.

The switch might be applied to loop switching and also to by-pass or isolate individual substations without service interruption of the loop.

By equipping this switch with motorized mechanism for automatic switching any of the above applications might be expedited and the use of the equipment extended.

An important point in the use of the switch is its single pole construction feature. It is applicable to areas of limited right-of-way or to eliminate acquisition of additional costly real estate. Single pole construction should be somewhat less expensive than the H-frame type.

The above thoughts suggest themselves after witnessing the actual tests made at Quitman, Georgia, and, of course, the careful analysis of the results thereof. There are, no doubt, many more uses that might be made of a switch that gives the fine performance presented by the tests."

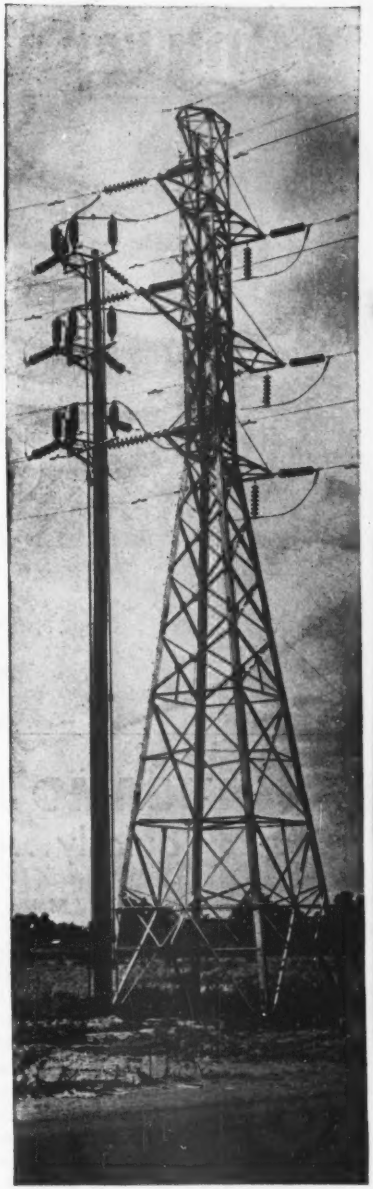
Very truly yours

(signed) E. F. Smith
Associate Professor
Electrical Engineering

*17 days later a Catalog 69KV600 GOABS broke 68.56 miles.

---

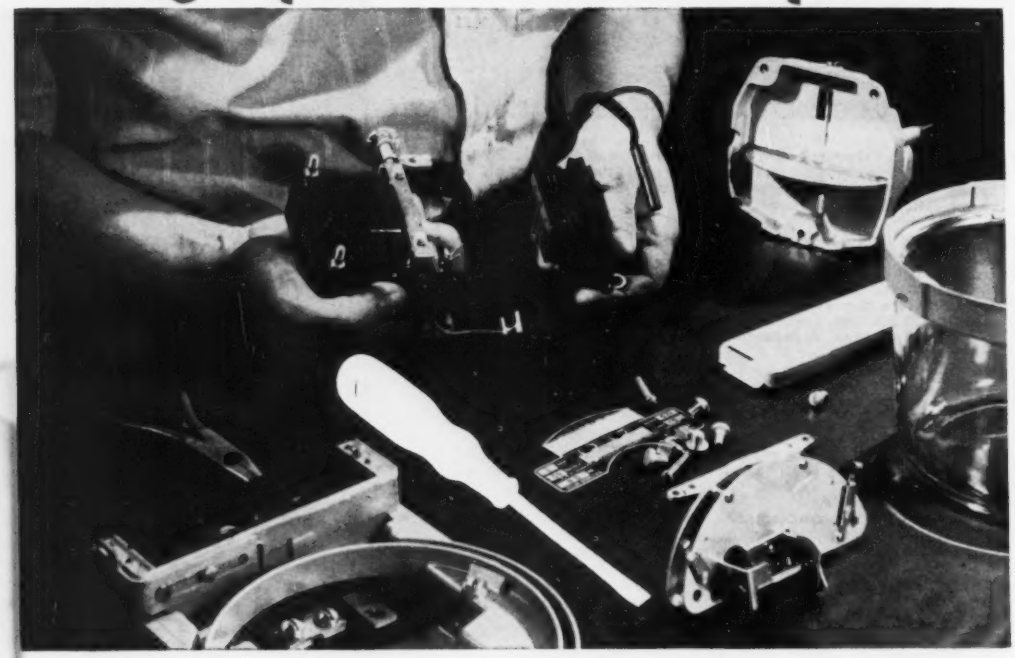
FOR MORE COMPLETE DETAILS ASK FOR BULLETIN 601-A.



This Catalog 69KV600 GOABS saved a lot of money for an Oklahoma power company approximately $7,500.00.


W. N. MATTHEWS CORPORATION
3850 DELOR STREET ST. LOUIS 16, MO.
ENGINEERS and MANUFACTURERS SINCE 1899

# Any repair is a minor repair...



## SANGAMO J METERS are back in service quickly...economically...conveniently

Sangamo J Meters have a good reputation for long troublefree service. They have unusual freedom from electrical failure due to high insulation levels . . . Troublefree operation is inherent in the oilless bearing system . . . They are designed to reduce repairs to a minimum.

But when infrequent repairs *are* needed —all that is necessary is a small stock of interchangeable parts, and a minimum of time. Even a potential coil or a current element can be easily replaced in a matter of minutes—right in your own shop—with Sangamo's separable electromagnetic element! You can replace any part of Sangamo J Meter and be well within the range of adjustment.

Sangamo Watthour Meters on your system mean lower labor costs, a smaller stock of parts, and fewer meters on the shelf.

* * *

*Sangamo J Meters have proved their ability to meet the requirements of today and the anticipated loads of the future with sustained accuracy, economy of maintenance and troublefree performance.*

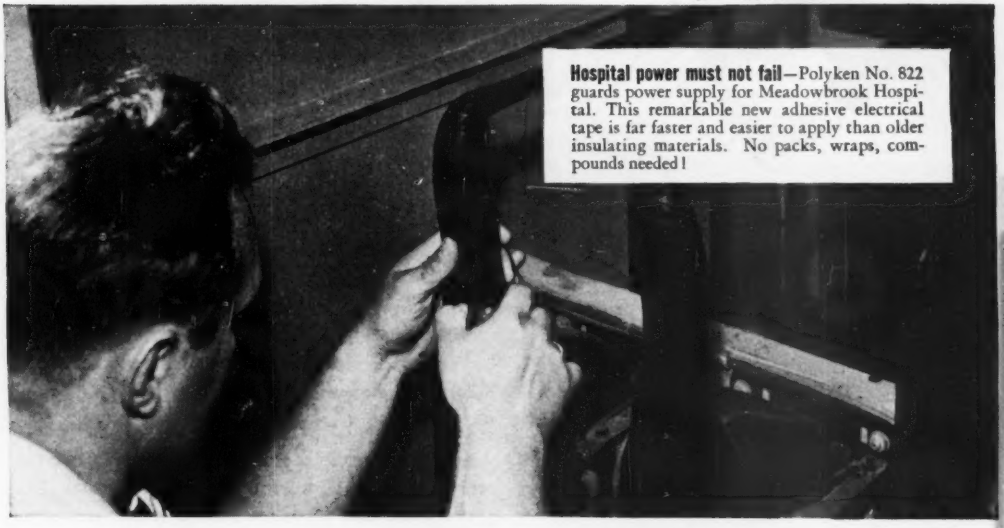
**SANGAMO**
**ELECTRIC COMPANY**
SPRINGFIELD, ILLINOIS

THE NEW

# Polyken®

## INDUSTRIAL TAPES

TAILORED TO YOUR JOB



**Hospital power must not fail**—Polyken No. 822 guards power supply for Meadowbrook Hospital. This remarkable new adhesive electrical tape is far faster and easier to apply than older insulating materials. No packs, wraps, compounds needed!

# New tape applied in half the time controls high voltage

The new Polyken Tape No. 822 wraps high-voltage installations in *half the time* required by old methods.

This means convenience, speed, and an obvious savings in labor.

Take, for example, Meadowbrook Hospital, Nassau County, N. Y. They formerly used varnished cambric, but have now cut insulating time by 52% using this inexpensive corona-quenching tape for cable and bus bar insulation of their double-end power center.

Here's Polyken No. 822: only .009 inch thick, but with 10,000 volts dielectric strength. Stretches both ways to conform to irregular surfaces—the only oriented polyethelene tape with a successful pressure-sensitive adhesive. Solventproof, corrosion-proof—for splicing, wrapping, corrosion-coating, and hundreds of other uses. Write for samples.

Or ask us about *another* Polyken tape—let our Tape Engineer analyze *your* particular problem. *Let us see if YOU have a job where tape can cut labor time in half.*

**Polyken, Dept. EWL, 222 West Adams St., Chicago 6, Ill.**

For specifications, samples, and further information on this and other Polyken tapes, please send me your *FREE BOOKLET*, "Tape is a Tool."

Name_____ Title_____

Company_____

Street Address_____

City_____ Zone____ State_____

***Polyken* Industrial Tape, Department of Bauer & Black, Division of The Kendall Company**

# KEEP YOUR OILS IN FIGHTING TRIM!

Every drop of insulating oil or turbine oil is a constant target for contaminants. Both oils are game fighters, but they don't last long when "Killer" contaminant gets in his Sunday punches.

The best break the "Killer" likes is to have "Battling" oil come back into the fight . . . round after round . . . with no period of rejuvenation in between.

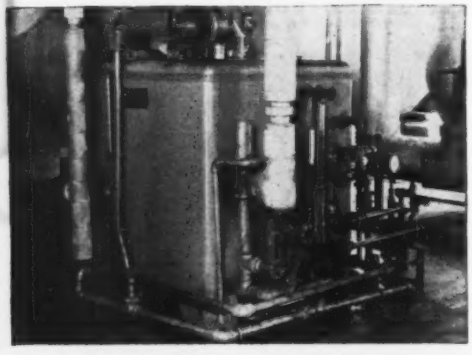
With Bowser in the "Battler's" corner, he wins . . . every time!

Portable Bowser insulating oil conditioning unit for transformers, circuit breakers and switches.

## INSULATING OIL

Bowser conditioners keep transformer insulating oil in top fighting form. Between every round of the perpetual contest with air, moisture, dirt and corrosive acids . . . every drop is completely dehydrated, degasified, stabilized and cleaned.

Oil dielectric is restored above 35 k.v. in a single pass and transformers remain energized during the process. Less standby equipment is needed . . . one man and a truck-mounted conditioner can maintain a widespread substation system.



Bowser turbine oil conditioner serving a 52,000 c.f.m. turbo-blower

## TURBINE OIL

Turbine oils have to put up an especially tough fight against these 8 "killers" . . .

| | |
|---|---|
| Turbulence | Metallic Contact |
| Air Entrainment | Inhibitor Removal |
| Moisture Contact | Fly-ash |
| Heat | Dust |

None of them has a chance when a Bowser turbine oil conditioner is on the job. Costly shutdowns are avoided . . . bearings last indefinitely.

A new Bowser booklet that tells all . . . shows all . . . is yours for the asking. Write to Bowser, Inc., 1384 Creighton Avenue, Fort Wayne 2, Indiana

BOWSER ESTABLISHED 1885

LIQUID CONTROL SPECIALISTS SINCE 1885

MAKE A *Good Connection!*

# WEAVER

## CAST GROUND ROD CLAMPS

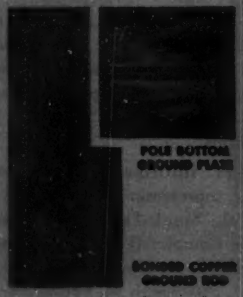
CAST of high strength Aluminum Bronze, WEAVER GROUND ROD CLAMPS withstand great tightening torques without distortion and assure permanent high pressure connections.

They are designed to assure perfect alignment between rod and wire, and the long wire-bearing surface provides exceptionally good contact.

Clamps are provided with either hex head or socket set screws which are specially machined with rounded points to prevent damaging the surface of the Ground Rod.

For top quality at lowest cost, you can't beat WEAVER CAST GROUND ROD CLAMPS.

GROUND ROD CLAMP



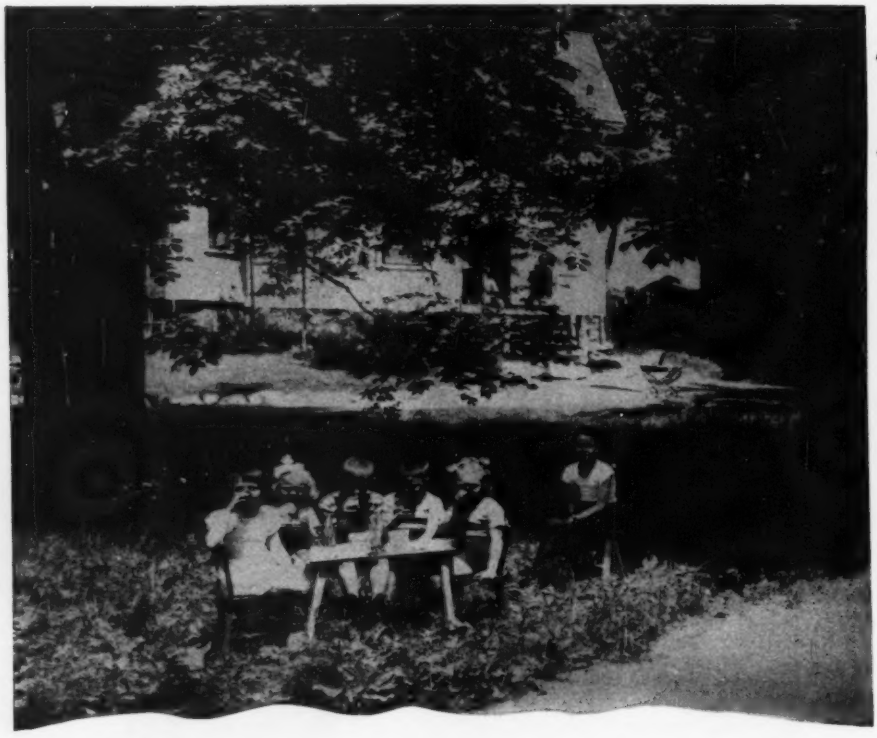

Write for the latest Weaver Catalogue

J.A. WEAVER CO.

ST. LOUIS 6, MO.

2110 HOWARD ST. CE. 0881

# The Tea Party Proves *it's SAFE here!*



We're sure that the utility didn't propose this substation as a public playground. But with its location in the heart of a young residential area, they knew it had to be safe. That's why they installed a Westinghouse "CSP"® (Completely Self-Protecting) Power Transformer with underground lines. It makes a compact, completely enclosed single-feeder unit substation . . . so safe that it may be installed without special fences or guardrails. There are other, greater economies, too:

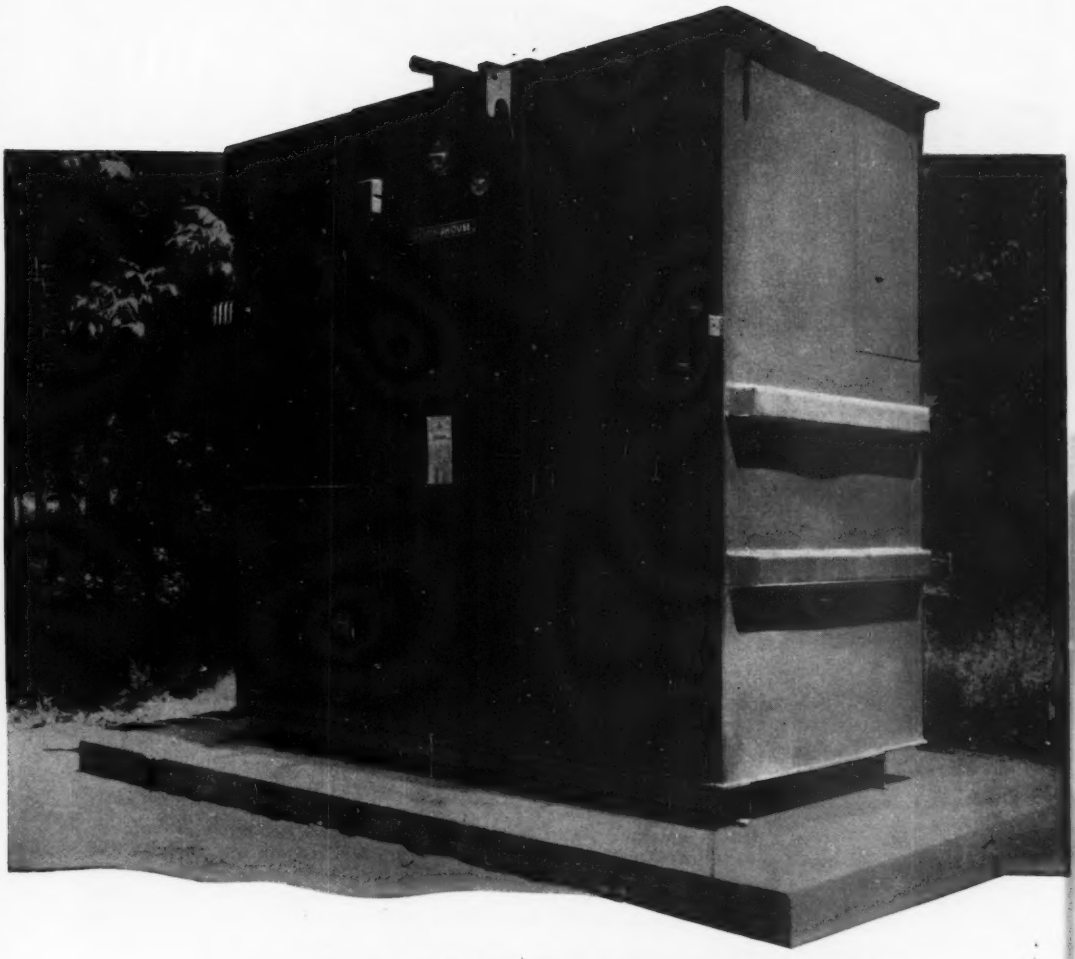
*You save when you order.* Specify and order just one complete unit . . . instead of 35 to 45 components.

*You save when you install.* Simply lay a mat, set the unit in place, and tie it in. No co-ordinating or separate mounting problems! No overhead structures! No protective barriers!

*You save on maintenance and long-run operation.* It's a "CSP" unit, with built-in protection. It will handle short-time overloads without service interruption and will save itself from burnout if the load becomes dangerous.

For further information, ask your Westinghouse representative for a copy of booklet B-4292, "Single-Feeder Unit Substations that are Completely Self-Protecting", or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70603

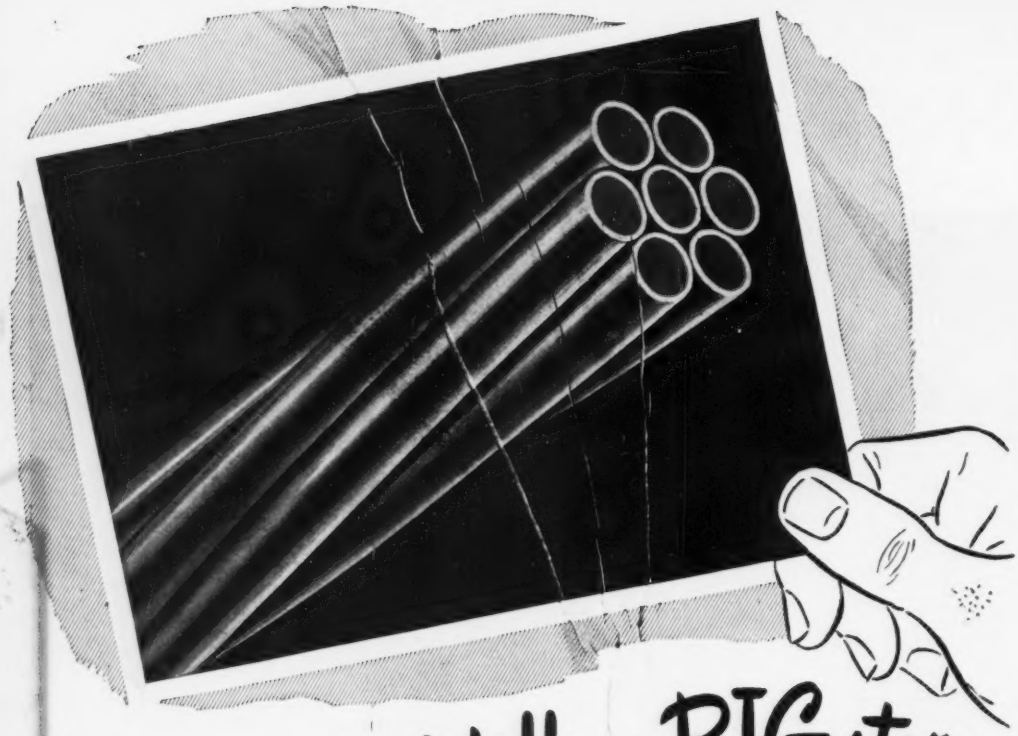


YOU CAN BE SURE... IF IT'S

Westinghouse

"CSP" POWER TRANSFORMERS

SINGLE FEEDER UNIT SUBSTATIONS



# a picture that tells a BIG story

Here's a greatly enlarged photo of Bethlehem's seven-wire Form-Set strand. It's a simple picture . . . but it tells a story of major interest to everyone who buys or uses guy strand, messenger wire, static wire, etc.

First, as the photograph shows, this Bethlehem strand is preformed. That's what the trade name Form-Set means. Each of the wires is given its permanent curl before being laid—*PRE*-formed to smother internal tension. Hence, when the strand is cut, its several components cannot fly apart. The ends can't "bush out." Form-Set strand is easy and pleasant to handle—a real time- and temper-saver. It slips into fittings as easily as a pencil would.

Another point to observe is the coating. Note how smooth and uniform that coating is. The wires have been bethanized; treated electrolytically with zinc so that a thick, protective armor is gradually bonded to the steel. The bethanizing process, a Bethlehem development, insures a coating so ductile that it won't check, crack, or peel, even under severe bending. It stays tight, locked snugly to the wires it protects.

When you buy Form-Set strand, you are buying a truly superior product—one with definite advantages. Call us whenever it's convenient to discuss full details. A Bethlehem man will be glad to explain just why this strand will do a better job.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
*Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

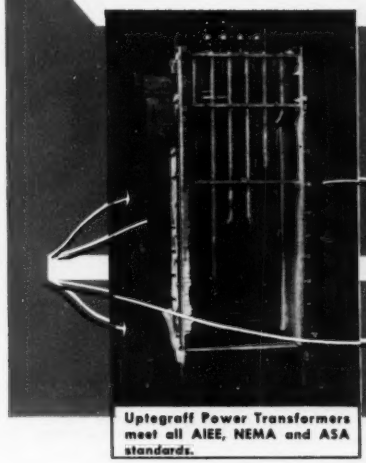
## Bethlehem *FORM-SET* Strand

For your

# HIGH VOLTAGE

requirements

## Uptegraff POWER TRANSFORMERS



Uptegraff Power Transformers meet all AIEE, NEMA and ASA standards.

Built to meet standard or special requirements, Uptegraff High-Voltage Power Transformers are made in sizes through 10,000 KVA, for use on all voltage systems through 115 KV.

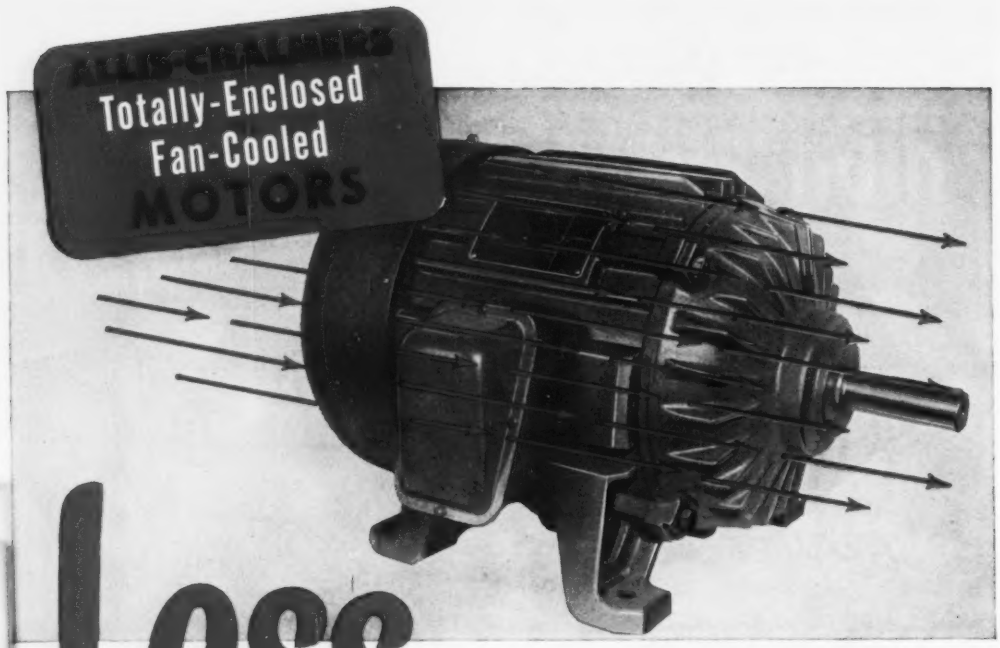
Among the important construction features that contribute to long life and safe operation are: strong, rigid tanks, designed to withstand full atmospheric pressure for vacuum filling; radiators designed for ready access for cleaning and painting; synthetic rubber-impregnated cork gaskets, with gasket stops to prevent over-compression; positive-positioning tap changers with high-compression contacts; shot-blasted tanks finished with three coats of lasting paint.

Uptegraff offers complete engineering, manufacturing and testing facilities, including 1.5-million volt impulse generator now being installed.

We will be glad to have your inquiry for High-Voltage Power Transformers built to meet your particular needs.

**R · E · UPTEGRAFF MANUFACTURING CO.** SCOTTDALE PENNSYLVANIA

*Makers of* POWER · DISTRIBUTION · INSTRUMENT · SPECIALTY TRANSFORMERS




# Less MOTOR CLEANING ...INSPECTION...OVERHAUL!

HERE'S A MOTOR that actually blows itself clean! Dirt is carried away by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor.

Dirt can't build up to cause overheating. Concealed air passages and pockets have been eliminated. Even oily dirt that sticks can simply be wiped or blown off.

And this means savings! Maintenance costs are traditionally low on totally-enclosed, fan-cooled motors. But they're lower than ever before on the new Allis-Chalmers Type APZ tefc motor.

**Rigid Construction**

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

**Get All The Facts**

The new Allis-Chalmers Type APZ totally-enclosed, fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

A-3426

***Sold . . .***
***Applied . . .***
***Serviced . . .***

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

**CONTROL** — Manual, magnetic and combination starters; push button stations and components for complete control systems.

***TEXROPE*** — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

**PUMPS** — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

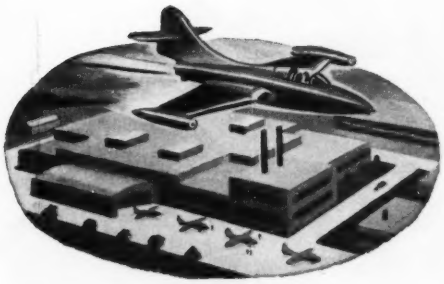
*Texrope and Vari-Pitch are Allis-Chalmers trademarks.*

**ALLIS-CHALMERS**

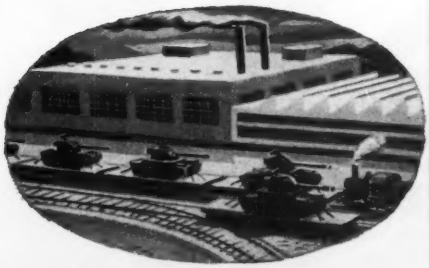
*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

# POWER
# *when you need it!*

**TRIANGLE products keep power flowing—to factories producing jet planes, to shipyards, atomic energy plants, tank and gun assembly lines—to *all* defense industries.**



TRIANGLE produces a full line of quality WIRE, CABLE AND CONDUIT—products that will stand up under the most severe conditions—products that will not fail.



**To be certain YOU get power when you need it—specify TRIANGLE.**

**Ask your electrical distributor. He knows—"It *Must* Be Right!"**

THE TRADE-MARK OF TOP QUALITY!

**TRIANGLE CONDUIT & CABLE CO., INC.**

NEW BRUNSWICK, NEW JERSEY

IT MUST BE RIGHT

Glazon Building Wire • Glazon Non-Metallic Sheathed Cable • Armored Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded Trioprene Trench, Power and Parkway Cables • Bare Wire • Rigid Conduit Hot Dipped Galvanized • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit

# Facts from KANSAS

# "'CSP' Transformers cut failures to zero"

"Until a few years ago, our system was equipped 100% with conventional transformers. A particularly hot rural line was giving us considerable trouble, so we decided to make a test installation of 'CSP' Transformers comprising 160 stations," says a Kansas Utility.

"Accurate records had been kept for two years prior to installation of the 'CSP' Transformers and were also kept for the two succeeding years. The records show that of the conventional transformers, 45 had been damaged by lightning, and required 491 service trips for re-fusing.

*"Of the 'CSP' Transformers, not one was damaged. Only 39 instances occurred where secondary breakers opened to protect the transformers from short-circuits or overloads. This record gave us good reason to adopt the 'CSP' Transformer for all future construction and replacement."*

Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following: J-70590

**NATIONAL AVERAGES**

| | "CSP" | Conventional |
|---|---|---|
| Installation Costs | $13.87 | $24.74 |
| Burn-out Rate | 0.257% | 1.005% |
| Fuse Outages | None | 5.64% @ $6.52 per outage |
| Load Checks | Automatic | 12.8% |
| Breaker Reset | 1.02% | None |

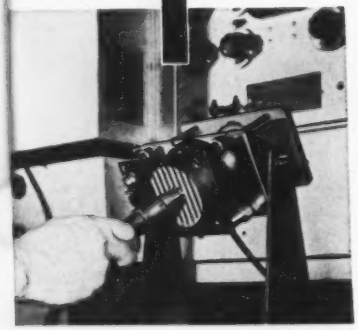
If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet 4-247-B, "Transformer Costs and Their Relation to Profits", Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

*"CSP" devices . . . originated and patented by Westinghouse.*

YOU CAN BE SURE... IF IT'S
Westinghouse
"CSP" DISTRIBUTION TRANSFORMERS

*This Western Electric employee mounts a transmitter in the test fixture which is swung down to face an artificial mouth at 45-degree angle, just as transmitters are held in use. More than a million transmitters are tested each year.*

# This mouth speaks to millions



*At Bell Laboratories a scientist employs a condenser microphone to check the sound level from another type of artificial mouth, used in transmitter research.*

To serve the changing needs of telephone subscribers millions of telephone sets have to be moved each year. Before being put back into service most of them are returned to the Western Electric Company's Distributing Houses where they receive a thorough checkup.

Western Electric engineers needed a rapid method of testing transmitters over a range of frequencies. At Bell Telephone Laboratories, scientists had just the thing—a technique they had devised for fundamental research on transmitters. In co-operation with these scientists, Western Electric engineers developed the practical tester in the illustration.

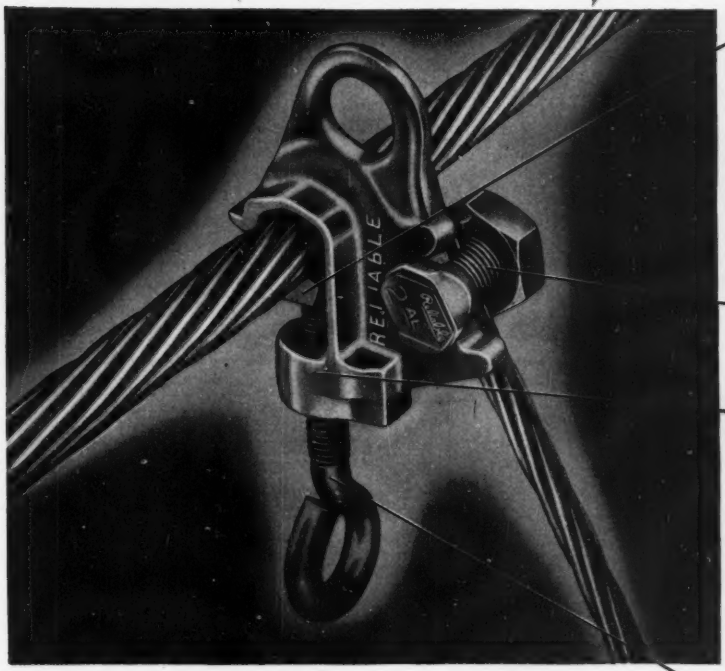
The transmitter is removed from the handset and put in front of an artificial mouth which emits a tone that swings several times per second over a band of frequencies. A signal lamp tells whether the transmitter is good. Each test takes 5 seconds.

This new tester illustrates how Bell Laboratories research and Western Electric manufacturing skill team up to maintain your telephone service high in quality yet low in cost.

## BELL TELEPHONE LABORATORIES

• EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

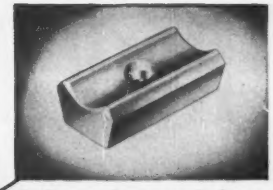
# *Accents on Accuracy*




in the manufacture of

## ALUMINUM HOT LINE CLAMPS

Manufactured of high-strength, heat-treated aluminum alloy, Reliable aluminum hot line clamps assure long, dependable service. Every step of manufacturing is closely controlled so that in use they work easily and smoothly with hot line tools. Where copper taps are used corrosion is minimized by a thick bi-metal copper-aluminum spacer in the tap connector. Galling and seizing are eliminated by threading the bronze eye screw through a bronze insert in the aluminum body. Reliable's accent on accuracy both in design and manufacture insures economy of operation through easier installation and longer life.



**1.** Pressure bar on end of eye-screw is a highly accurate, die formed, solid aluminum extrusion of generous area.

**2.** Sure and efficient tap connections are assured with the Reliable split bolt connector with its many elements of accurate manufacture.

**3.** Bronze insert is threaded into clamp body and rolled top and bottom. It is squarely tapped to provide highest percentage of thread engagement.

**4.** Silicon bronze eye screw has precision rolled threads and accurately centered rivet end for precision alignment with pressure bar.

**Reliable ELECTRIC COMPANY**

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS
AND
CONSTRUCTION SPECIALTIES

# How To Select a Power

HOW DO YOU KNOW the transformer you select will give you most performance per dollar over the longest time?

Transformers are pretty well standardized in appearance, ratings and original specifications. Some people may even think they *are* the same. But based upon ability to stand up in service, it's amazing how transformers differ.

Just look at the corona-free design, for example.

In the corona-free transformer designers eliminated corona* at the maximum test levels. Transformers like these retain full impulse strength even after repeated lightning and switching surges. They stay young. They're built to last years longer and *do*.

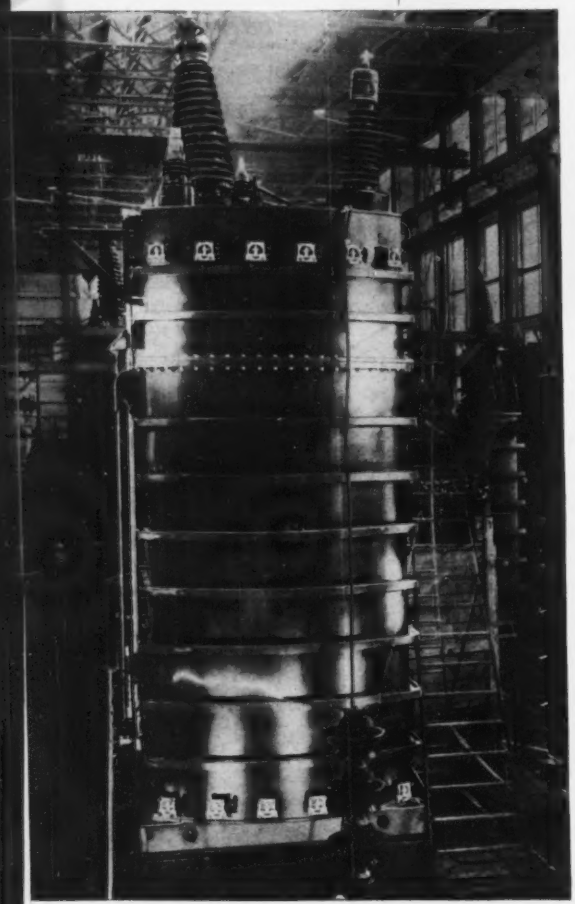
Corona-free design at Allis-Chalmers is the result of 19 years of research and testing — when lightning first became a recognized factor. Through use of calculating boards, powerful surge generators and oscillograms, engineers were able to detect the slightest trace of corona during impulse tests and take steps to eliminate it.

They put in close-fitting insulation around coils and conductors, eliminated voids, diffused dielectric flux so that each part of the winding was corona-free at maximum test conditions.

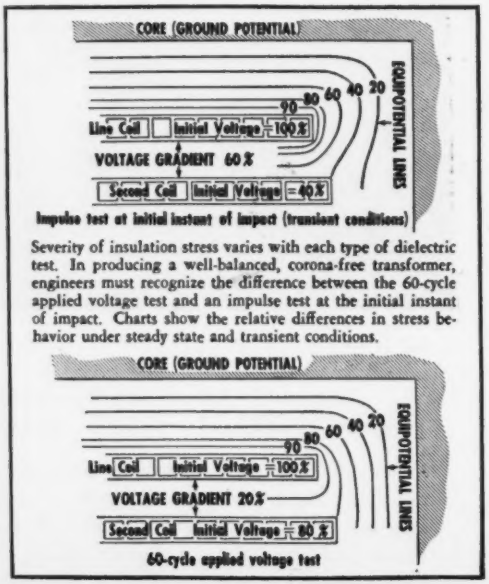
Failure-free operation of these power transformers means long lasting performance . . . more performance for each dollar invested. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3489

*Corona is a dielectric discharge that scores insulation and destroys impulse strength.

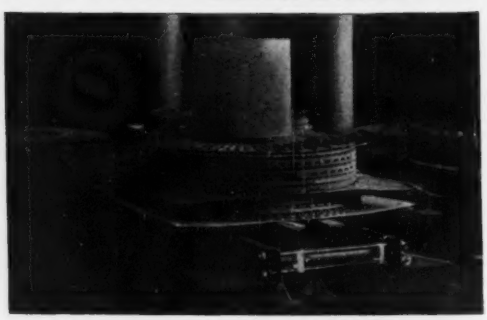


An AIEE chopped wave test at 1,035,000 volts for this 35,000 kva autotransformer is one of its last performance checks before shipment. New equipment and streamlined testing procedures have cut testing time from weeks to hours.



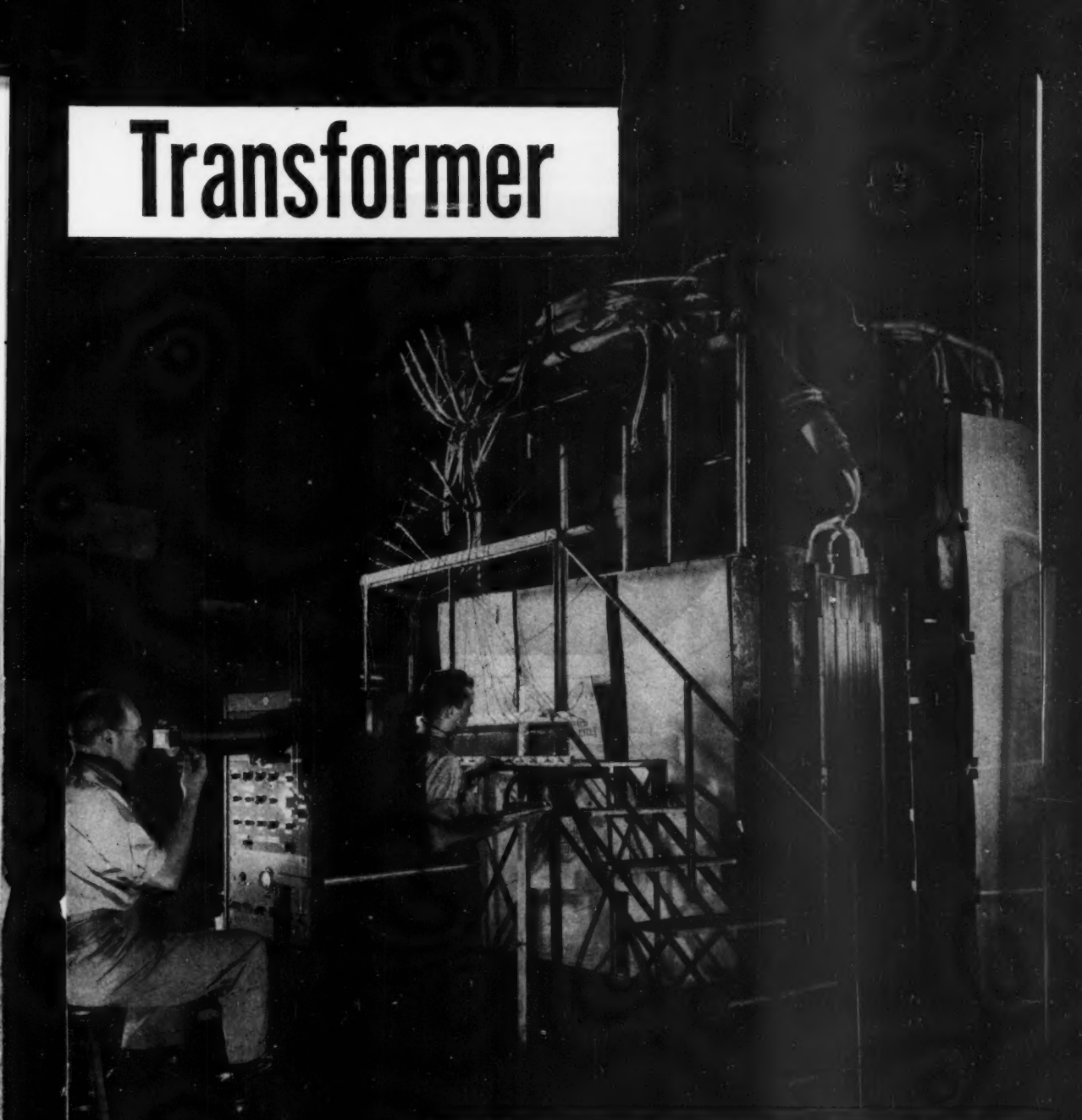

Severity of insulation stress varies with each type of dielectric test. In producing a well-balanced, corona-free transformer, engineers must recognize the difference between the 60-cycle applied voltage test and an impulse test at the initial instant of impact. Charts show the relative differences in stress behavior under steady state and transient conditions.



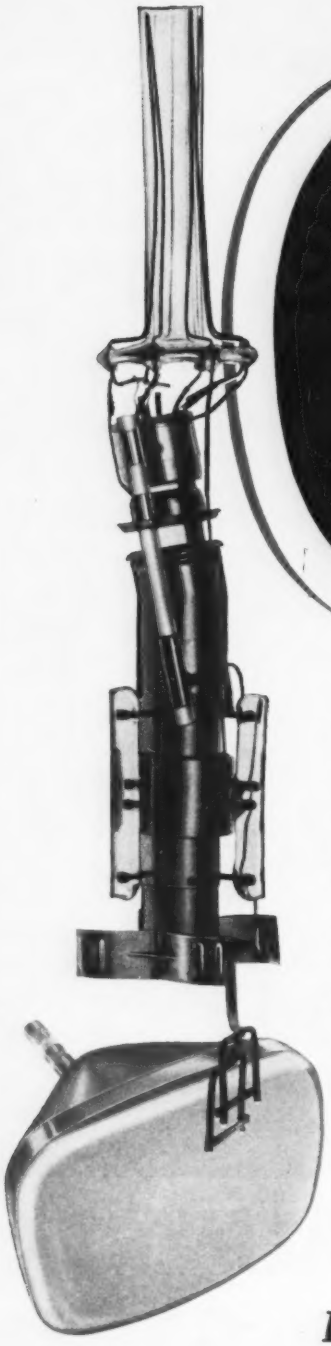
Form-fitted insulation you see on this 30,000 kva forced oil-cooled transformer will reduce the effects of concentrated dielectric fields. By placing insulation next to areas of dielectric stress and by rounding insulation surfaces, dielectric stress is reduced.

# Transformer



**ALLIS-CHALMERS**

This 50,000/66,667 kva transformer for a Texas utility is getting a voltage distribution test before its final full-voltage impulse test. Such a design check tells whether the assembled transformer will react properly under maximum impulse voltage stresses.



# D-H RADIO ALLOYS

## *Provide Important Parts for*

# DU MONT'S

## *Selfocus Teletron*

Latest development in picture tubes is the Du Mont Selfocus Teletron which provides *automatic focus at all times without the aid of external circuits or devices.* This eliminates the focusing coil or PM unit now used on standard electromagnetic-focus picture tubes, affording a substantial saving of vital materials in the manufacture of television receivers.

The Selfocus Teletron employs electrostatic focus with magnetic deflection, and this type of receiver is unique among electrostatic-focus tubes because its focusing element is operated at zero volts and is tied internally to the cathode through a resistor.

The elimination of focus circuits from the receiver is made possible largely by the focusing cylinder of the Selfocus picture tube. The unusual design of the cylinder and the precision with which it can be located in the electron gun produce increased picture quality by minimizing defects which have been inherent in conventional picture tubes. With greater control of these defects, it is possible to maintain quality uniformly from tube to tube.

Driver-Harris, who has been supplying Du Mont with alloys for cathode ray tubes for more than 10 years, supplies Stainless Steel 18-12 and special D-H Nickel No. 599 for manufacture into important parts of the electron gun of Du Mont's new Selfocus Teletron. The special requirements of this facet of the television industry are well served by the properties of these metals.

At present, strategic materials and the alloys made from them are inevitably on strict allocation. However, we shall be glad to make recommendations based upon your specific needs, and serve you to the best of our ability.

*Makers of the most complete line of electric heating, resistance and electronic alloys in the world*

## *Driver-Harris Company*

**HARRISON, NEW JERSEY**

*T.M. Reg. U.S. Pat. Off.

**BRANCHES:** Chicago, Detroit, Cleveland, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

**THE OLD WAY:**
***strong contrast***
***deep shadows***

**the**
**GUTH WYTE-LINER WAY:**
***low contrast***
***soft shadows***

Here's a new idea in factory lighting to lift the eyestraining gloom off the ceiling:

ALL WHITE INSIDE—to reflect maximum light down and outward onto the working area.

ALL WHITE OUTSIDE—to reflect room light upward, brighten the ceiling and soften brightness contrast.

Easier to clean—reduces maintenance. Airflow Channel circulates air currents for longer ballast life.

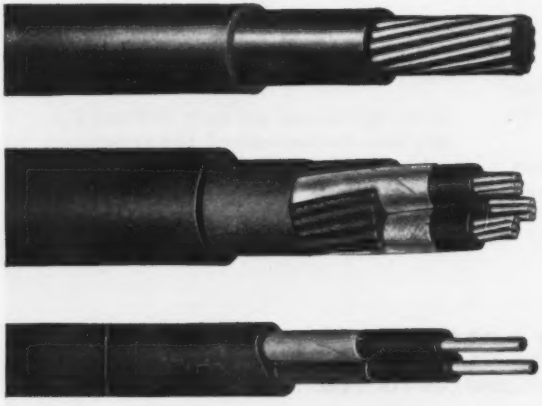
GUTH Wyte-Liners are made in 2 and 3 lamp sizes for conventional 40-watt lamps and for 4- and 8-ft. Slimline. May we send you our 16-page Catalog 48-H with complete details?

**Guth LIGHTING**

**THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI**

*Leaders in Lighting since 1902*

Underwriters approved as Type USE—Style RR for 600 Volts. First to be approved by Civil Aeronautics Administration as Type A insulation for airport wiring under Specification L-824.



**RECOMMENDED FOR**

**DIRECT EARTH BURIAL**

**OVERHEAD**

**IN CONDUIT**

# Insure Your Power Load With

# RoMarine - RoPrene

## ALL-PURPOSE POWER CABLES

### Street Lighting Cables

Rome manufactures a wide range of high and low voltage cables for underground, or overhead wiring of series and multiple lighting systems . . . *designed to meet your requirements.*

RoZone*-RoPrene Series Street Lighting Cable—5000 Volts

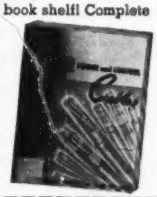
RoLene-Rome Synthinol* Series Street Lighting Cable—5000 Volts

RoLene Ornamental Pole and Bracket Cable—
4000 to 12000 Open Circuit Voltage

***JUST OFF THE PRESS!***

**The New Rome Power and Control Cable Catalog**

This new sixty-page catalog will be an important addition to your book shelf! Complete in every detail, it includes descriptions, test data, specifications and suggested applications for all Rome Power and Control Cables. You'll find it invaluable for specifying. Mail coupon below today!



*T. M. REG.

You can't beat RoMarine-RoPrene for secondary network circuits, underground entrances, street lighting, or general purpose wiring. Exceptionally versatile, it is equally at home in country or city . . . can be installed direct in earth, in underground ducts, conduit or in air. If it's RoMarine-RoPrene you *know* you're right.

For long, economical service life RoMarine-RoPrene gives you *double protection* against costly circuit failures. RoMarine insulation affords high resistance to heat and moisture. The RoPrene (Neoprene) sheath has excellent resistance to oils, acids, alkalies, corrosive fumes, flame and abrasion. Its wide acceptance attests its popularity . . . hundreds of thousands of feet in service have proved its dependability.

RoMarine-RoPrene is less costly, easier to handle, tap and splice than lead sheathed cables. It is unaffected by electrolysis, extreme temperature changes and installed underground provides insurance against power outages from destructive storms. Its versatility reduces inventory.

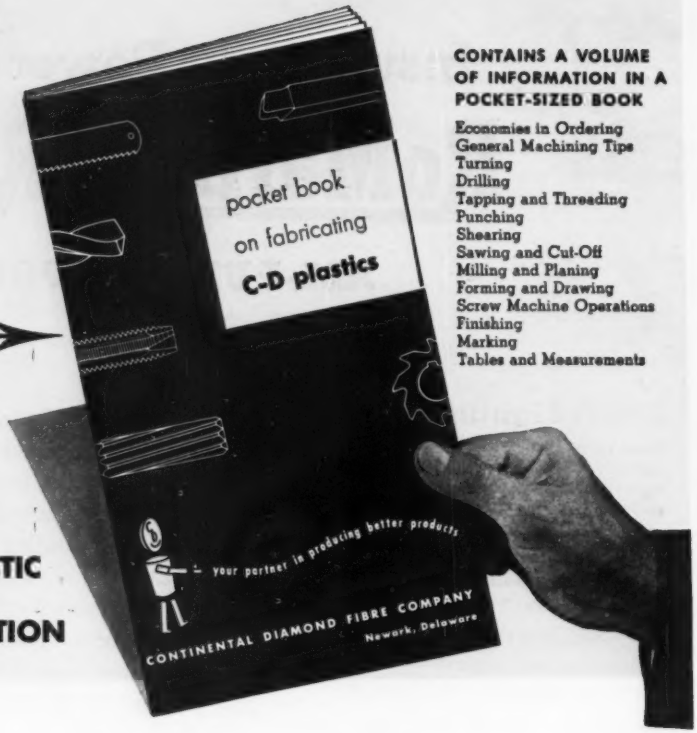
*IT COSTS LESS TO BUY THE BEST*

Copper wire mill products are a Controlled Material under N.P.A. Controlled Materials Plan. USE YOUR CMP ALLOTMENT.

**ROME CABLE**
*Corporation*
ROME · NEW YORK
*and*
TORRANCE · CALIFORNIA

ROME CABLE ROME, N.Y.

# NEW




**CONTAINS A VOLUME OF INFORMATION IN A POCKET-SIZED BOOK**

Economies in Ordering
General Machining Tips
Turning
Drilling
Tapping and Threading
Punching
Shearing
Sawing and Cut-Off
Milling and Planing
Forming and Drawing
Screw Machine Operations
Finishing
Marking
Tables and Measurements

## tells how to

- ▶ **REDUCE COSTS**
- ▶ **CONSERVE PLASTIC**
- ▶ **SPEED FABRICATION**

This NEW "Pocket Book on Fabricating C-D Plastics" places at your fingertips a wealth of practical, easy-to-use information that can help you conserve plastics . . . speed assembly . . . lower fabrication costs . . . get more production from every man working with plastics.

Written by men who understand your problems, it is filled with valuable tips and suggestions on general rules to follow, tooling recommendations, feeds and speeds. Put to use in your plant, it will help you get the most from every rod, sheet and tube of plastic you use.

Write today for your copy. A note on your company letterhead, giving your title, will bring your free copy of the "Pocket Book on Fabricating C-D Plastics." No obligation, of course.

*your partner in producing better products*

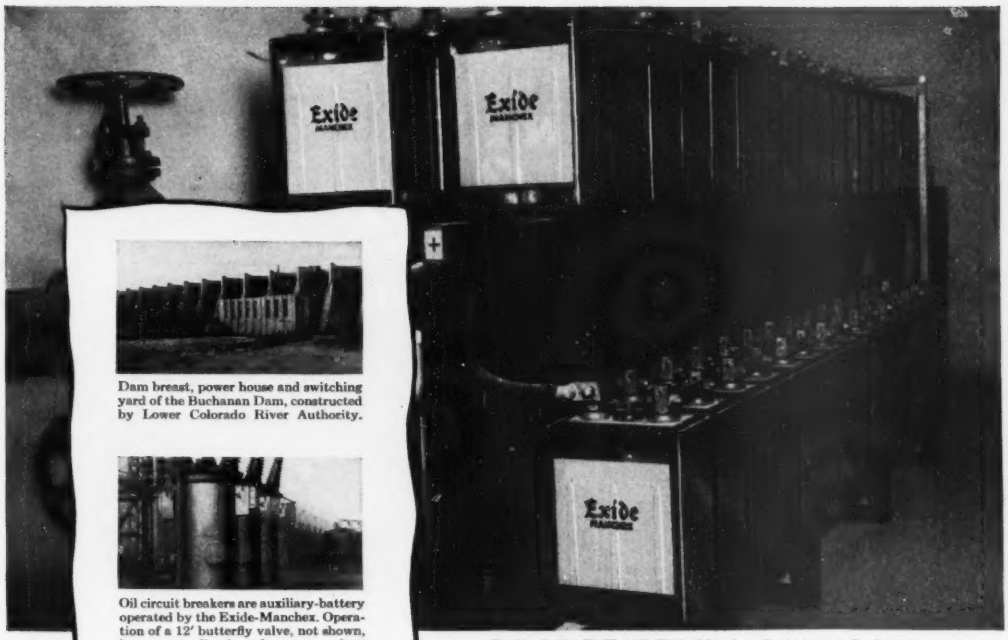
**DILECTO** (Laminated Thermosetting Plastic)
**CELORON** (Molded High-Strength Plastic)
**DIAMOND FIBRE** (Vulcanized Fibre)
**VULCOID** (Resin Impregnated Fibre)
**MICABOND** (Bonded Mica Splittings)

DE-6-51

BRANCH OFFICES: NEW YORK 17 • CLEVELAND 14 • CHICAGO 11 • SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES
WEST COAST REPRESENTATIVE: MARWOOD LTD., SAN FRANCISCO 3 • IN CANADA: DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO 8

**Continental-Diamond FIBRE COMPANY**

*Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK 15 DELAWARE*






Dam breast, power house and switching yard of the Buchanan Dam, constructed by Lower Colorado River Authority.



Oil circuit breakers are auxiliary-battery operated by the Exide-Manchex. Operation of a 12′ butterfly valve, not shown, is a new application of emergency battery power.

Bank of 60—EME-13C Exide-Manchex Batteries at Buchanan Dam. Mounted back to back on two 2-step Exide Racks.

# POWER for the heart of Texas

# Exide-Manchex BATTERIES

A short distance above the capital city of the Lone Star State, a power station enlarged in 1949-50 is in operation. Buchanan Dam, a unit of the Lower Colorado River Authority, is one of the most modern and finest equipped stations in the country.

Among this fine equipment at Buchanan Dam is the Exide-Manchex, which provides dependable standby power for all storage battery operations. A logical choice, for in Exide-Manchex Batteries you get:

**POSITIVE OPERATION.** Dependable performance at ample voltage with no switching failures.

**INSTANTANEOUS POWER,** at high rates for switchgear operation, adequate reserve power for dependable performance of all other control circuits and also emergency lighting.

**LOW OPERATING COST:** Extremely low internal resistance.

**LOW MAINTENANCE COSTS:** Water required about twice a year. No change of chemical solution needed during life of battery.

**LOW DEPRECIATION** . . . due to sturdy, long-life construction.

**GREATER CAPACITY** in a given amount of space avoids overcrowding of equipment.

These are the features that help to make Exide-Manchex *your best battery buy* for all control and substation services.

• • •

**LEAD CALCIUM BATTERIES**

Exide first produced Lead Calcium Batteries in 1935. Since that time we have progressively followed an extensive program of laboratory research and development along with a study of Exide Lead Calcium Batteries in actual service.

Much has been learned during those 16 years. Though the time is too short to specifically predict length of battery life, definite conclusions have been reached regarding proper application. We will be glad to inform you where these cells can satisfactorily serve.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia 2
*Exide Batteries of Canada, Limited, Toronto*
"Exide" and "Manchex" *Reg. Trade-marks U. S. Pat. Off.*

*1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951*

MOLONEY

# HiperCore

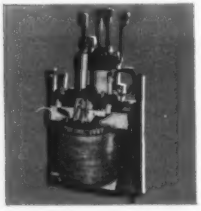
CSP DISTRIBUTION TRANSFORMERS

## DESIGNED TO MEET YOUR NEEDS BETTER . . . AND MORE ECONOMICALLY!

The Moloney HiperCore CSP Transformer with wound cores of cold-rolled silicon steel combines superior operating characteristics with low maintenance costs. Operating records show the better voltage regulation and greater short-time overload capacity of the HiperCore Transformer.

The CSP equipment contributes to the low maintenance costs on these transformers. Not only are they protected against lightning surges and short circuits, but also against overloads which tend to shorten the life of a transformer.

CSP equipment consists of the following: Lightning arresters, primary fuses, tank grounding gaps (on tanks not solidly grounded), and secondary circuit breaker with indicating light (to indicate overload).



Simplicity of design of the core-and-coil unit plus liberal use of materials and adequate cooling ducts make HiperCore Transformers cooler operating and better performing, resulting in longer life under normal operating conditions.

CHECK THESE FEATURES of all HIPERCORE TRANSFORMERS

- ✓ **Excellent voltage regulation**
- ✓ **High short-time overload capacity**
- ✓ **Light weight**
- ✓ **Small size**
- ✓ **Long operating life**
- ✓ **Low temperature gradient**

ME51-17

MOLONEY ELECTRIC COMPANY

*Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations*

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

# Editorials

## Do You Know the Menace of Inflation?

Electric rates are going to turn upward. All the ingenuity of engineers and management can no longer stem the inflationary tide that engulfs us. A great record, that probably never can be equaled by any other industry, has been made. While the average worth of a dollar dropped almost one half, the electricity it can buy increased materially.

We believe that the electric utility industry in spite of inflation will remain healthy for a long time to come. Good management and unlimited demand for service will assure stability and growth. But, nevertheless, inflation is one of the foremost enemies of utilities. High capital investment with inadequate depreciation allowances remain a constant hazard. Increasing labor and material costs without flexible rate adjustments keep earnings too near minimum levels. Heavy expansion of electric plant with 50¢ dollars loads the capital structure for years and years to come.

These factors alone are sufficient to alert the utility man to the menace of inflation. But on top of this we have the threat to our national economy and the savings of millions of Americans.

The causes of inflation are many and varied. The most important factors are government fiscal policy, spending for defense and unnecessary governmental projects, and price support programs. But equally important is the pressure of a money supply in the hands of the people that is much greater than the supply of goods available to them.

The problem of inflation can be licked only by a concerted effort on the part of every American. The causes, effects, and cure for inflation are detailed in an article entitled "Inflation Concerns Everyone" by S. B. Pettengill in the October, 1951, issue of *The Readers Digest*. It is must reading for everyone.

In its conclusion this article points out seven important steps which one can take to combat inflation. They are summarized as follows:

**1. Write your Congressman.**

**2. Give a good day's work for a day's pay to increase productivity.**

**3. Stop unnecessary spending.**

**4. Economy begins at home. Watch your local government.**

**5. Do your best to make sure that everyone in your neighborhood is aware of the menace and what can be done to combat it.**

**6. Above all, save.**

**7. Pay your taxes without evasion.**

One of our industry's able spokesmen on this subject is Dr Adam S. Bennion, vice president, Utah Power & Light Co. He is doing an excellent job alerting the industry and the public. We need many others to tell the story and develop popular support against the menace of inflation.

## Editorializing on Mr. Straus' Remarks

"Today power is one of the main piers on which rests the entire Reclamation structure (*an honest confession*), an integral and inseparable part of the operation (*that's not news*), a benefit ranking generally with the irrigation benefit itself (*very mildly stated*), but far ahead of the irrigation it makes possible when it comes to paying the bill (*You can say that again*).

"From April 16, 1906—the day when the federal government first took legislative cognizance of Reclamation power—up to the hectic present, the principles under which that power is made available to the American people have remained unaltered (*Isn't it time for a change?*). It is sold preferentially to public bodies and cooperatives, sold in such a way (*by price cutting tax-paying companies*) as to assure widespread use and to prevent monopolization (*except by the federal government*), and sold at the lowest possible cost consistent with sound business principles.

"Some people did not like these policies (*Maybe their ideas of sound business are different.*) then. Some (*include Electrical World*) don't like them now. But anybody who destroys them will simply be destroying Reclamation (*Knowing how bureaucrats cling to life, we doubt it.*)."

This frank statement was made by Michael W. Straus, commissioner of Reclamation, at the annual convention of the National Reclamation, Association, Oct. 18, at Amarillo, Tex. We were equally frank in inserting the italicized material. We just don't believe that it is sound business to support reclamation projects by taking business away from tax-paying electric companies. If a reclamation project is worthwhile, let those who benefit from it pay the bill.

## Citation for a Compromise

"For coordination and integration of the electric system of the United States and the contractor." This is not a quotation from a citation though well it might be. It is the purpose, as stated in the preamble, of the power contract signed recently (EW, Oct. 15, p 12) by the Bureau of Reclamation and Pacific Gas & Electric Co. Both deserve to be cited. For this contract and the "wheeling" contract (EW, April 9, p 85) which it supplements may set a pattern for disposing of electric energy generated by future federal projects.

The two, ten-year California contracts were signed only after a three-year battle. They provide for the disposal of power generated at the three power plants (504,000 kw) of the Central Valley Project. This power will be available first to the bureau's preference customers. PG&E can buy the remainder. In effect the two systems are integrated. PG&E steam will firm the output of the federal hydro plants. In turn they will help PG&E over the peaks.

But best of all the "wheeling" contract may protect the company's area. Preference customers are carefully defined, and the bureau will be unable to deny that it is the transgressor if it raids the company's territory to get more of them. Furthermore, to the saving of the taxpayers, the bureau will not build duplicating transmission lines.

Like most compromises these contracts are not perfect. Public power proponents may say they are too restrictive. They prevent the bureau from realizing the full benefits which would be possible with its own steam plants and transmission lines. Private power proponents will point out that the preference customers are still there and that the bureau system is getting the benefits of steam without any additional investment.

Both groups may be right in their claims. But is not an honorable peace preferable to an enervating war? Is not one coordinated system serving the people of California at less expense to the taxpayers in all 48 states better than two systems fighting endlessly at the expense of taxpayers and stockholders alike?

## HF on F Lamps

There is altogether too much attention being given to the difficulties in the way of high frequency operation of fluorescent lamps—in industrial application anyway.

In many industrial plants high frequency circuits already exist, some of them quite extensive. They are used for hand tools on assembly lines—screw drivers, nut runners, drills, reamers, and the like. Also there are many induction heating circuits, powered by rotating machines of considerable capacity.

This is not to suggest that such circuits be extended to serve lighting installations, although in some cases it probably would be possible to put a few special lamps on existing ones. It is merely to remind those exploring the attractive possibilities of high frequency operation of fluorescent lamps that there is already in existence a considerable body of experience and know-how on the production and distribution of high frequency energy. It should be drawn upon. We don't think it is. At least, we get that impression from talking with lighting men. There seems, at first glance, no reason why lighting, induction heating, and operation of tools may not be combined in one high frequency system.

## A Tool for Teachers

Do teachers, clergymen, or similar groups in your community understand the electric light power industry? If they don't, a booklet published by Teachers College of Columbia University will be of help. Entitled "Electric Power and Social Policy," this booklet is intended to be a resource guide for teachers and discussion leaders. Since Edison Electric Institute and a score of prominent power company executives aided by providing data and other information, there is no distortion of facts. You will want to see that many in your community have and use this booklet.

# The Electrical Week

**INDUSTRY MOBILIZATION (Pages 94 and 95)—Depa issues "Surplus Letter" to aid utilities in buying and selling surplus materials . . . First quarter metal allotments to appliance makers are cut sharply . . . Rejection of manufacturers' orders by metal suppliers places utilities' metal supply in double jeopardy . . . Samuel W. Anderson heads DPA's new Office of Aluminum . . . Claimant agencies for electric utilities and heavy equipment manufacturers fared well in first quarter allotments of structural steel . . . Manufacturers' price regulations are changed by Capehart Amendment.**

*WASHINGTON—Interior has until Feb. 1 to file final appeal in Roanoke Rapids case with the Supreme Court (p 90) . . . USBR survey indicates Missouri Basin Power must triple in the next 20 years (p 91) . . . Assistant Secretary Warne leaves Interior to take Point 4 post in Iran (p 91).*

**ELSEWHERE—Central Hudson Gas & Electric Corp sells a rate increase (p 88) . . . CIO endorses public power over opposition of Utility Workers Union president (p 90) . . . Aluminum firms are taking steam power from BPA (p 92) . . . Use of capacitors on utility systems has jumped 16 times in two decades, PEA Systems Operation Committee is told (p 93).**

• • •

*Washington—Secretary of Interior Chapman appoints Donald R. McClung, vice president and assistant to the president of Pacific P&L, director of the Materials and Equipment Division of Depa, succeeding Thomas E. Marburger of Consolidated Gas, EL&P, resigned . . . Now comes South Carolina Public Service Authority to argue that its Santee-Cooper hydroelectric project was designed primarily for navigational purposes and is not subject to $85,000 administrative charges levied against it by FPC.*

**Pittsburgh Metallurgical Co may move out of South Carolina if South Carolina Public Service Authority General Manager R. M. Jefferies prevails in his contention that the drought relieves Authority of any firm (power) commitments.**

***General Electric's outdoor Xmas lighting display at Nela Park will be open from Dec. 7 to Jan. 1 . . . McGraw Electric Co (Line Material Co) completes arrangements to buy Jeffrey-Dewitt Insulator Corp, Kenova, W. Va. . . . Hotpoint gets tract of more than 400 acres in Oaklawn, Chicago suburb, to build $20 million plant "as soon as defense restrictions permit."***

**From the Midwest—Bradner and Huron, Ohio, to retain their municipal power ownership . . . Cleveland Electric Illuminating becomes one of 14 U.S. companies with peak load of more than a million kw, registering record 1,006,000 kw Nov. 8 compared with 1,134,000 total plant capacity . . . Cincinnati G&E reports record output of 10,015,000 kwhr Nov. 6, compared with previous record of 9,672,600 kwhr Aug. 14 . . . Missouri Public Service asks PSC and FPC approval to merge with Missouri G&E . . . Missouri Edison asks PSC okay to buy Westhoff L&P.**

*New company, Arizona Public Service, will emerge March 1 with consolidation of Central Arizona Light & Power and Arizona Edison.*

**From the West—Public power proponents in Northwest are becoming concerned over monthly deficits of $1,000 and an unpaid power bill of $18,000 owed Bonneville Power Administration by North Wasco County (Oregon) PUD.**

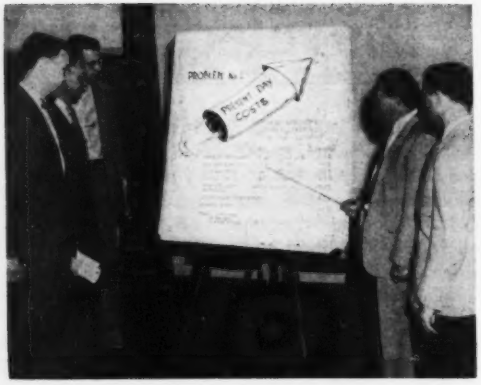
*Financing—Morgan Stanley & Co, Drexel & Co, and Glore, Forgan & Co group buys 249,942 shares of Public Service E&G 4.70% cum pfd stock at 100; reoffers at 102.17 a share to yield about 4.60% . . . Pennsylvania P&L asks PUC approval to sell eight manufactured gas properties and a steam heat plant to Scranton-Spring Brook Water Service for $3,150,000 . . . Jersey Central P&L accepts proposal for purchase of its gas facilities by County Gas Co . . . CEICo completes $805,000 purchase of Berea, Ohio, municipal plant.*

**Electric Rates—FPC orders $2.6 million reduction for energy generated at Conowingo Project on Susquehanna River and transmitted by three subsidiaries of Philadelphia Electric . . . Pennsylvania PUC suspends until May 12 a $2,730,000 year rate increase for industrial and commercial customers of Pennsylvania P&L.**

*Congratulations—Walker L. Cisler and James H. Lobban elected president and executive vice president, respectively, of Detroit Edison, effective Dec. 1 . . . Boston Edison promotes Frederick M. Ives from vice president and general counsel to chairman of the board and Thomas G. Dignan from executive vice president to president and chief executive officer . . . Metropolitan Edison elects W. H. McElwain and G. Raymond Parry vice presidents . . . Pennsylvania W&P promotes G. Whittier Spaulding from executive vice president to president . . . James F. Lincoln, Lincoln Electric Co, Cleveland, elected president of the National Electrical Manufacturers Association.*

**1. Laying of Plans . . .**

Starts with the preparation of large charts by the advertising department explaining the reasons for the raise




**2. Indoctrinating . . .**

Twenty leaders to explain the necessity for the increase to employees was task of Educational Director D. L. Fenner

**5. The Man in the Street . . .**

Stops an employee. This happened all over 2,500-sq mi area; over 1,000 employees were glad to explain raise

**6. The Barber . . .**

Wanted to know just how much this increase was going to cost. "Just a trivial amount," employee reassures him.

# Central Hudson Sells a Rate Boost

## Employees Are Enlisted and Trained to Carry the Company's Story to Customers; New York PSC Grants Entire Increase (12½%) Asked

Central Hudson Gas & Electric Corp has been granted a rate increase by the New York Public Service Commission. The $1.7 million a year boost (averaging about 12½%) was exactly the amount requested. That this request was granted without opposition from its customers was not a matter of luck. Central Hudson called upon its employees to carry the company's story to the public. This is how the company trained them to do the job.

On Sept. 6 when it filed its request for the increase, over 99% of the employees were assembled at 20 locations throughout the company's service area. These meetings were in charge of leaders who had been thoroughly indoctrinated at classes taught by Educational Director D. L. Fenner. Reasons for the increase were carefully and concisely explained in a series of talks. Illustrated charts pounded home the facts and data so that the employees could carry an intelligent story to the customers. The need for the raise if the company is to continue its expansion program was stressed.

**3. The Office Force . . .**

**Gets all necessary data and information about proposed rates and is encouraged to discuss raise with customers**

**4. The Family . . .**

**Learns about the raise from daddy. Central Hudson employees were advised to tell families about the increase**

**7. The Cop . . .**

**On the beat is told why the raise is necessary. "Look, Charlie, the cost of everything is rising. We need a hike"**

**8. The Homemaker . . .**

**Chats with a serviceman. He explains to her that continued good service depends on company getting the raise**

The company supported the employees with an advertisement, "Central Hudson Must Have an Increase in Electric Rates." This was run in 35 area newspapers. It showed, "What This Rate Increase May Mean to You." In actual money, the ad told the customers, your bill will be increased this much:

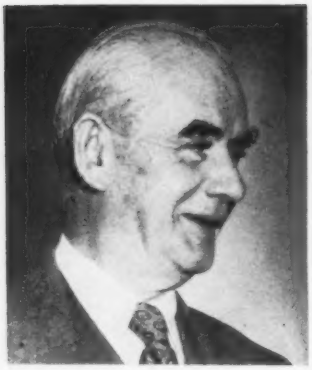
| If your present TWO-MONTH electric bill is: | Your new TWO-MONTH electric bill may be: |
|---|---|
| $4.00 | $4.35 |
| 8.00 | 9.00 |
| 12.00 | 13.60 |
| 16.00 | 18.00 |
| 20.00 | 22.50 |
| 30.00 | 34.20 |

Another part of the program was a letter addressed to all employees by Pres Ernest R. Acker along with a summary of the information that was discussed at the rate meeting.

In the letter, he said ". . . As you well know, employee compensation, the cost of coal, line material, and everything we buy has increased just as the things you buy for your own use. As a result, we cannot sell electricity in 1952 at the same price at which we are selling it now.

"In order to keep our business financially strong, we have no alternative but to now ask our customers to pay a little more for their electricity. This is important both to the company and to its customers because we cannot continue to supply good, reliable service and meet the ever-increasing needs of our customers unless the company is in a position to pay fair wages to its employees and to pay a fair return to the people who have invested their savings in our business."

The summary of information given to the employees said: "Today, if living cost had remained at the same level as electric service, you could buy food at the following prices—even with the proposed increase: Coffee at 24¢ a pound, bread at 9¢ a loaf, and rib roast at 32¢ a pound. But coffee is about 95¢ per pound—bread 18¢—and rib roast 90¢ per pound."



Dick Wolters

OPPOSED on public power were Phil Murray of the CIO, Joe Fisher of the UWU

# Public Power Is Reindorsed by CIO Over Opposition of UWU President

Over the expressed opposition of Joseph Fisher, president of the Utility Workers Union, the Congress of Industrial Organizations recently reaffirmed a resolution favoring public generation, transmission, and distribution of hydroelectric power.

The resolution, passed Nov. 8 at the CIO's convention in New York, was titled, "Principles of Tennessee Valley Authority." Besides public generation, transmission, and distribution of hydro, it said these principles included:

1. Public construction and operation of such auxiliary steam plants as may be needed to support public hydropower operations.

2. Public credit to municipal and cooperative agencies for acquisition of existing facilities where desirable.

3. Administration of all river engineering and electric power operations by a single federal authority with headquarters in the region.

4. Full and complete recognition and protection of the right of employees to organize and bargain collectively through representatives of their own choosing without interference by the employer.

5. The management of all electric power and river engineering work in accordance with sound policies of regional planning and the cultivation and conservation of national resources.

"We have called repeatedly," the resolution said, "for the extension of these principles to all other river valleys throughout the country."

Fisher told Electrical World the UWU differed with the CIO mainly on its interpretation of TVA principles.

"These aren't the real principles of TVA," he said. "The main purpose of TVA when it was set up was for flood control, and to prevent soil erosion. We approve of that."

The UWU, he said, did not approve of public construction of steam plants, transmission lines, and appropriation of moneys to take over existing facilities. Taking over "existing facilities," he said, referred to taking over private companies, something his union opposed.

"We don't want the principles in the resolution extended to all river valleys," he added.

When the resolution came up for debate, Fisher said utility workers on public power projects were often in a less favorable position than those working for private companies. He suggested the measure be referred back to the executive committee so representatives of the UWU could point out its "inequities."

Philip Murray, CIO president, reaffirmed the Resolutions Committee stand on the question, but suggested a committee of vice presidents be appointed to meet with representatives of the UWU to try to reach more general agreement.

"The delegates to this convention will note," he said, "that the premise upon which we built our support to the resolution . . . is that Congress in giving consideration to any regulatory legislation over either the people of hydroelectric plants or the transmission of power developed in these plants, even under government ownership, must give rightful consideration to the workers' rights."

(See Washington Comment, p. 98)

•

## Warren Asks State Build Project on Feather River

Gov Earl Warren of California has made two important announcements concerning proposed plans to build a $1-billion power and water project on the Feather River near Oroville.

1. Warren wants the state to pay for the construction of the project through the issuance of revenue bonds rather than have the federal government build it.

2. He will ask the legislature at its March budget session to include in the budget at least $800,000 for engineering studies of the project.

Warren remarked at a news conference that many things must be worked out with the federal government to prevent "duplications and overlapping" in state development of the Feather River Project and operation of the federally constructed Central Valley Project.

The project proposes a 3.5 million acre ft dam on the Feather River, power development at the dam site and the transportation of water by canals into southern California.

•

## Interior Has Until Feb. 1 for Final 'Rapids' Appeal

Interior Sec Oscar L. Chapman now has until Feb. 1 to appeal the Roanoke Rapids case to the U. S. Supreme Court.

A petition by Chapman for a rehearing of the case by the U. S. Court of Appeals for the Fourth Circuit has been turned down, but the action did result in extending the time limit by five weeks for filing an appeal.

The Circuit Court decision upheld the federal license granted Virginia Electric & Power Co to construct a $27-million hydroelectric project at Roanoke Rapids in North Carolina.

# Missouri Basin Power Must Triple in 20 Years, USBR Survey Shows

Electric power in the Missouri Basin must triple in the next 20 years to meet projected requirements, a preliminary survey of power resources by the U. S. Bureau of Reclamation indicates.

The survey, in the nature of a reconnaissance, was requested by Interior Department in connection with its own power development in the basin. It is stressed that further studies are needed to fill in the details.

Future supply figures used in the survey take into consideration only the power generation now planned by privately owned companies or authorized by government agencies. The estimated requirements are based on an average of 7% increase a year until 1960 and 5% between 1960 and 1970.

### Supply and Demand Listed

Here is the outlook for basin requirements and supply based on these qualifications: 1950, 4.4 million kw supply against 4.6 million kw demand; 1960, 6.5 million kw supply against 8.5 million kw demand; and 1970, 5.5 million kw supply against 13.4 million kw demand.

The million-kw drop in supply between 1960 and 1970, Reclamation explains, will be caused by retirement of relatively inefficient steam plants in the area.

### Ten States Included

The Missouri Basin, as defined in the report, is 1,300 miles long and 700 miles wide, with an area of 529,000 sq miles. It includes all or part of ten states: Nebraska, practically all of Montana and South Dakota, more than half of Wyoming, North Dakota, and Missouri, the northeastern quarter of Colorado, the northern half of Kansas, and smaller areas of Iowa and Minnesota.

Federal hydroelectric projects in the basin, either in operation, under construction or scheduled, will account for an estimated 2.6 million kw. Reclamation believes there are 147 prospective hydro sites in the basin, which could account for another 2.1 million kw of capacity by 1970. In all, power produced from hydro projects could account for 57% of the capacity needed 20 years from now.

Additional thermal-electric plants, supplemented by available importations, must provide the balance. These plants could be powered, in large part, by available coal and lignite deposits within the borders of the basin area, according to the bureau.

•

## Warne Leaves Interior to Assume Point 4 Post

William E. Warne has resigned as assistant Interior secretary for water and power development to become director of Technical Cooperation for Iran.

In his new State Department job, he will have the personal rank of minister, which is considered a step above the assistant secretaryship. He will help formulate and administer the Point 4 Program in Iran.

Warne has been one of the chief spokesmen for Interior's power program both before Congress and the public during the past few years. He was in the forefront of the bitter Central Valley Project controversy in California, in which Interior was charged with attempting to rule the valley by controlling the main water resources.

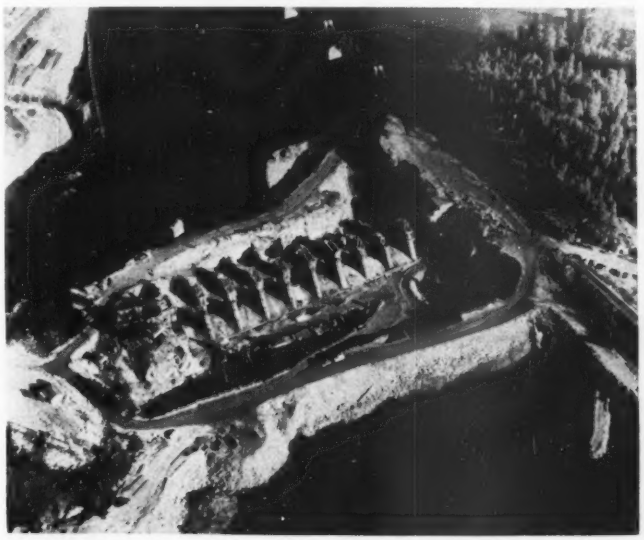
During his 15 years with the department, Warne served four years as assistant commissioner of reclamation and four years as assistant secretary of the department.

For some time he has been considering a shift of position. Acquaintances in the department say Warne sees more room for advancement in the Point 4 Program position than he saw at Interior.

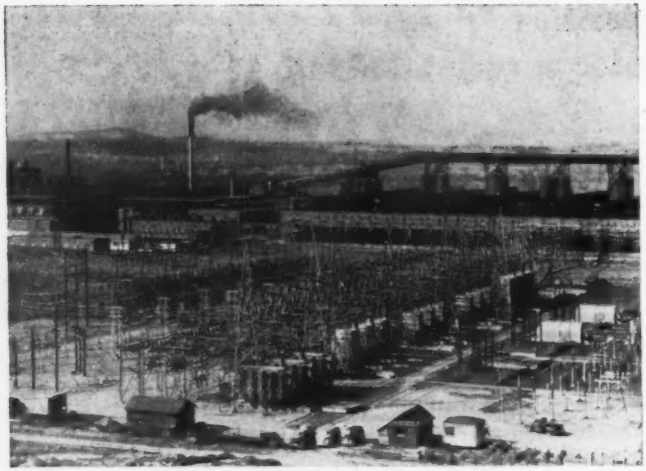
•

## Plan Arizona Plant

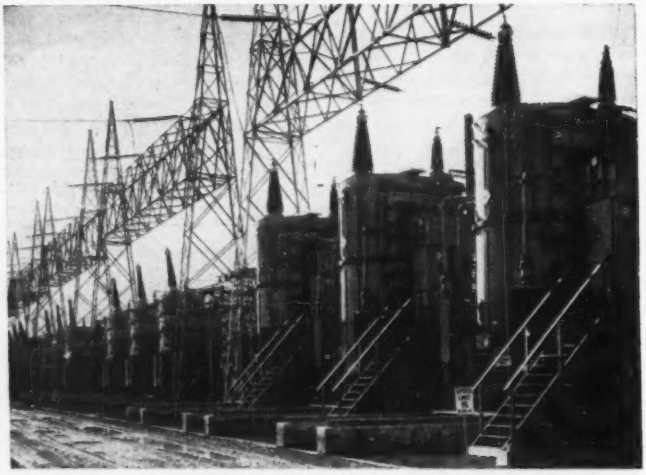
Arizona's three major utilities, Central Arizona Light & Power Co, Salt River Valley Water Users Association, and Arizona Edison Co, are jointly studying plans for a proposed 120,000 to 180,000-kw steam generating plant to be built in central Arizona at a cost of from $15 million to $22 million. Officials of all companies confirm that engineering studies for the plant are under way.



**CONCRETE WORK has ceased for the winter at Albeni Falls Dam on Pend Oreille River near Newport, Wash. About 36,000 cu yds have been poured since ground was broken Jan. 26. Power plant, to be constructed next spring, will develop 42,600 kw. Lake behind the dam will store 1,140,000 acre ft of usable water**



## Bonneville's Mead Substation . . .



## Renamed in Memory of Glenn H. Bell

Bonneville Power Administration's Mead substation north of Spokane, Wash., has been renamed to honor the memory of Glenn H. Bell, who served for several years as manager of Bonneville's Upper Columbia District.

Among the largest in the world, the station covers 20 acres and handles distribution of major blocks of power from Grand Coulee and Bonneville Dams.

In the top picture, Kaiser Aluminum Co's reduction plant, served by BPA, forms a backdrop for the ranks and files of transformers, synchronous condensers, and circuit breakers that make up the substation.

Lower picture is a closeup of the main transformer bank. Three in the foreground are 150,000 kva, the rest, 100,000. The station has two types of circuit breakers: 115 kv oil and 230 kv AEG (German) air blast. Its synchronous condensers are rated at 30,000 and 35,000 kva.

## Aluminum Firms Taking Steam Power from BPA

Interruptible customers in the Northwest consumed about 40 million kwhr of steam-generated energy during the curtailment period which began Sept. 17, according to D. L. Marlett, assistant administrator of Bonneville Power Administration.

Aluminum companies accounted for about two-thirds of the total, with magnesium, chlorine, and other defense loads accounting for the rest. Total cost for the energy, including stand-by costs for some plants kept in readiness during October following return of interruptible power, will be about 13 mills per kwhr.

BPA was authorized by the aluminum companies to secure steam energy at the time of curtailment, and 134,000 kw of interruptible was carried on steam while 96,000 kw was dropped. Bills for the energy and stand-by costs are being certified by Bonneville and will be submitted by suppliers directly to the interruptible users. General Services Administration is expected to pick up part of the extra costs, although the amount is not yet known.

Marlett said no specific arrangements have been made regarding when or how much of the interruptible load will be supplied from steam energy should another period of curtailment be necessary. BPA will notify its interruptible customers when curtailment appears imminent, and give them the choice of authorizing steam or being cut off for half an hour or an hour during peak periods.

As the peak deficiency increases and becomes an energy deficiency also, the customers will have an opportunity to decide how much of any available steam they want to purchase to remain in operation. Estimated cost of such steam would be about 12-15 mills.

Rains over the weekend of Nov. 11 postponed any curtailment for at least another week, according to Joe Gumz, Depa coordinator for the area.

•

## Utility Aids Civil Defense

The Civil Defense Program in Indianapolis, Ind., has been helped by contributions made by Indianapolis Power & Light Co. The utility has donated the labor, installation, and power for 11 air raid sirens being placed throughout the city.

**PEA OFFICIALS at Systems Operation Committee meeting included: F. H. Lichtenwalter, managing director; P. H. Hess of Pennsylvania Water & Power Co, chairman of PEA's Engineering Section; A. C. Hartranft of Philadelphia Electric Co, committee chairman; and C. H. Conrad of Pennsylvania Electric Co, vice chairman**

## Utilities Now Use More Capacitors, PEA Is Told

In the last two decades, the use of capacitors on utility and industrial systems has increased 16 times to 16 million kvar, according to C. S. Dayton and S. R. Folger, General Electric Co.

They presented results of a study in the use of capacitors to the Systems Operation Committee of Pennsylvania Electric Association, which met in Split Rock, Pa., Nov. 8.

In that time, they said, the ratio of capacitor kvar to system peak has jumped from 1 kvar per 100 kw of peak in 1930 to 1 kvar to 4 kw of peak now. The peak will reach an eventual 1 kvar per 2 kw of peak, they predicted. The present rule of thumb for economic application of capacitors is 30 kvar per 100 kw of feeder peak load, spaced in proportion to feeder load distribution.

In analyzing factors involved in determining incremental energy cost, F. H. Light, Philadelphia Electric Co, told the group that although incremental fuel cost is 85% of the total, other factors such as maintenance costs and transmission losses are important and must be reflected in the rate. Labor is included by some companies in such rates and omitted by others, Light said. Philadelphia Electric does not include labor in incremental energy cost determinations, he said.

An "Emergency Assistance Roster" that lists key utility operating personnel and how to reach them in time of disaster was announced to the group by H. Ferguson, vice president, Pennsylvania Power & Light Co. The roster, which covers the states of Pennsylvania, New Jersey, Maryland, and Delaware, was prepared under the direction of Ferguson, as a personal project, and has since been adopted by the entire Pennsylvania Electric Association.

F. C. Mueller, vice president, Luzerne Division, Pennsylvania Power & Light Co, told the operation committee that the industry today faces four struggles: (1) the battle for manpower, (2) the battle for materials, (3) the battle over public power and (4) the battle of system expansion. The industry has lost ground in its battle with public power advocates until recently, he said, when the National Association of Railroad and Utilities Commissioners called for elimination of the "preference clause." In the battle for capacity, he added, the struggle for funds is vital and can be aided by public relations efforts of individual employees.

## New B. C. Hydro Projects May Add 1.5 Million Kw

Investigations are now going on in British Columbia which may yield more than 1.5 million kw of electrical energy.

On the Columbia River, south of Mica Creek and about 90 miles north of Revelstoke, Dominion government engineers have been investigating the possibility of a hydro project which would yield from 375,000 to 750,000 kw and involve a dam about 600 ft high.

Go-ahead on this project might force abandonment of a portion of the Big Bend Highway, route of the Trans-Canada Highway in B. C., but actual effect of the dam on the road would depend on the height required. Should plans call for a dam 600 to 650 ft, the highway might have to be re-routed since water would be backed up on the Columbia for about 40 miles from a narrow defile in the river below Mica Creek and might rise above the highway in certain areas.

As a result, the British Columbia government has suspended all further permanent work on the 200-mile Big Bend Highway until the situation is clarified.

Meanwhile, B. C. government engineers are studying a hydroelectric site at Moran, on the Fraser River 170 miles from Vancouver, which would yield more than 1 million kw.

•

## Hydro Project Started

Preliminary work has started on the dam site at the $30-million, 200,000-hp power plant on the Pend Oreille River at Waneta near Trail, B. C., which is being built by Consolidated Mining & Smelting Co of Canada, Ltd. The steel and concrete dam will rise 210 ft from the river bed.

### *Stern Decision*

**The Hilo (T. H.) Electric Light Co's generating plant was listing badly to port, so the company took out the equipment and set it up ashore.**

**Hilo then sold its old "plant" — the stern section of the wrecked tanker, *Fort Dearborn* —as 2,000 tons of scrap.**

### *Want to Buy or Sell Surplus Material?*

**Defense Electric Power Administration is willing to help utilities sell surplus materials. In the first of a series of "Surplus Letters" to utilities it announced that Delaware Power & Light Co has some 1,214 ft of 2½ in. IPS copper pipe for sale.**

**Depa is not making a survey of surplus. But it will serve as an exchange center if utilities wish such a service.**

**Purchase of materials from other utilities requires an allotment symbol the same as if the material were purchased from a regular supplier. However, Depa can make exceptions to allotment procedures in appropriate cases.**

**The pipe advertised for sale can be purchased for use:**

**1. In an approved major plant addition. The material will be charged against the utility's allotment for such major plant addition. Accordingly, an allotment in the amount of the purchase shall be returned to Depa on Form DEPA-6.**

**2. In minor requirements. This requires specific authorization from Depa. Requests for such authorization should be addressed to: Chief, Minor Requirements Branch, Defense Electric Power Administration, Washington 25, D. C.**

# Aluminum, Copper 1st Q Allotments to Consumer Durables Makers Cut

Manufacturers of consumer durables, including electrical appliances, have been cut sharply in copper and aluminum allotments for the first quarter of 1952. The good news is that this is expected to be the last severe cut. Second quarter allotments are expected to be about the same as the first. From then on, supplies are expected to improve. They will not, however, be normal before 1953.

The first quarter cuts were made by dividing consumer durables into two groups. One group, "essential to everyday living," got 50% as much steel as in the first half of 1950, 35% as much copper, and 35% as much aluminum. This is for the group as a whole. There is a wide variation by product. Refrigerators, ranges, and washers are in this group.

The second group consisted of nonessentials or products which could be made from substitutes. Included are such items as lamp shades, venetian blinds, and costume jewelry. They got 50% as much steel as in the base period, 10% as much copper, and 10% as much aluminum.

Makers of television and radio sets will get the basic 50-35-35 allotment. This will provide for 600,000 to 700,000 TV sets and 1 million radios.

Toasters, irons, coffee makers, and grills were cut sharply. They took a 30% cut in copper compared to this quarter, and a 25% cut in aluminum. They will give up 786,000 lb of copper, second highest among the consumer durable groups. Their loss of aluminum will be 1,349,000 lb. They lost a little steel, too.

By comparison refrigerators will give up more pounds of copper, 1,096,000. But this was a loss of only 17%. To offset this they won a healthy increase in aluminum and a small one in steel.

Electric ranges were cut 33% in copper, a loss of 223,000 lb. But they won small gains in steel and aluminum. Other kinds of household ranges were hit harder.

However, the cuts will not be as severe as they appear. Some fourth quarter allotments were used for appliances which went to military establishments. The first quarter '52 allotments are for civilian output only. Manufacturers will get extra materials for products going to the military establishments.

Manufacturers will be allowed to shift metals from one product to another as long as both are in the same group.

Government allocators believe the allocations will cut production to 50% of the rate of the first half of 1950.

## Double Jeopardy Hits Utilities' Metals Supply

Double jeopardy is making it more and more difficult for electric utilities to get materials.

1. Washington allocators cut down their requests to minimum requirements or less.

2. Steel and copper suppliers are turning down about 20% of the rated orders tendered by fabricators for electric utilities.

Defense Electric Power Administration, without giving figures, admits a substantial amount of structural steel and large quantities of copper and aluminum were lost to electric utilities during the third quarter by such turndowns.

Here are some of the reasons:

1. Fabricators of equipment for utilities must compete on the open market for the controlled metals after Defense Department and Atomic Energy Commission requirements have been met.

2. Under a recent regulation mills have a fairly wide choice in picking their customers. Naturally they give first preference to their best peacetime customers.

3. It is also suspected that many orders find homes in mills because of financial ties between industries, political expediency, friendship between executives, and other causes that may be charged to human nature.

Furthermore the claimant agencies at Washington allocated more materials than are available. They expected that there would be attrition because of failure of companies to use part or all of their allotment. So far this has not been the case.

•

## Anaconda to Up Copper Production 30,000 Tons

An agreement designed to step up domestic production of copper by more than 30,000 tons annually has been signed by Defense Materials Procurement Agency and Anaconda Copper Co.

The copper will come from Anaconda's Yerington Mine at Lyon County, Nev., which has ore of the oxide variety. Approximately $32,750,000 will be spent in developing the property, which has an estimated life of 10.5 years. Minimum produc-

tion during the first six years is estimated at 192,000 tons.

Terms of the agreement call for production of 30,000 tons the first two years of operation, and 33,000 tons per year after that.

Copper which the company cannot sell to industrial users will be purchased by the government at 25.5¢ per lb, FOB midwest markets. DMPA agrees to take a maximum of 128,000 tons during the first six years of operation. Production is to begin in two years.

•

## Named Head of DPA's New Aluminum Office

An Office of Aluminum has been set up in the Defense Production Administration with Samuel W. Anderson as deputy DPA administrator for aluminum.

Anderson, program vice chairman of the War Production Board in World War II, is charged with assuring a supply of aluminum to meet defense and essential civilian needs. He will have a hand in all phases of the aluminum production and expansion program.

Anderson comes to DPA from the International Bank, where he has served since March as special advisor to the loan director on procurement and priorities. Previously he was associated with several investment firms in New York.

•

## Structural Steel Alloted for Use in 1st Q of 1952

Claimant agencies for electric utilities and heavy equipment manufacturers fared comparatively well in getting first quarter 1952 structural steel allotments. But the allotments for the agency for smaller electrical equipment were cut down more severely.

First quarter structural steel allotments (in tons) and percentage of stated requirements for a selected few of the claimant agencies are:

Defense Electric Power Administration—143,000, 77.1; Engine and Turbine Division, NPA — 37,000, 96.2; Electrical Equipment Division, NPA—4,560, 33.8; Department of Defense—171,000, 88.9; Atomic Energy Commission—36,500, 99.9.

# Manufacturers' Price Regulations Changed by Capehart Amendment

Price regulations for electrical equipment and appliance manufacturers have been revised to conform with the Capehart Amendment.

The changes will mean higher ceilings for most manufacturers now pricing under Ceiling Price Regulations 22 and 30. In some cases, however—where cost decreases occurred prior to July 26—rollbacks may result.

New ceilings can go into effect as soon as proper notices are filed with the Office of Price Administration. The required applications — Public Form 100—are available at all OPS regional and district offices.

Manufacturers still under general price regulation must begin pricing under amended regulations by Dec. 19. But those already pricing under CPR's 22 and 30 can remain in that status as long as they like.

Principle differences between the orders as issued in April and the modified version are:

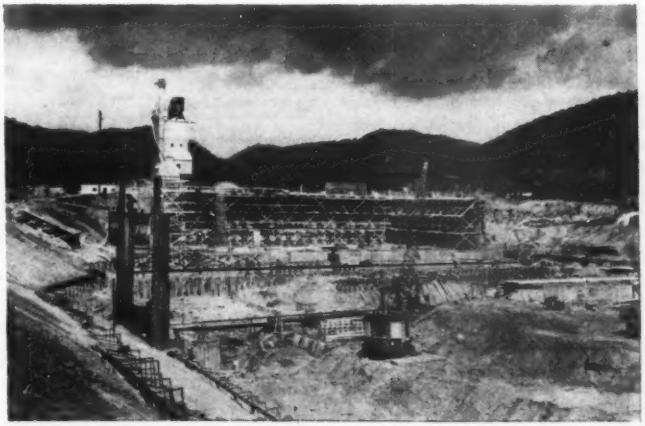
1. Pre-Korean base periods under the old orders were any of the four calendar quarters between July 1, 1949, and June 30, 1950, as amended; the orders require base periods of (1) Jan. 1, 1950, through June 24, and (2) either of the first two calendar quarters of 1950.

2. Cost increases originally had to be figured from the end of the base period selected; hereafter, manufacturers can use three alternative methods: (1) Adding increases to the high price of the Jan. 1—June 24 period, (2) adding increases to the June 24 price, and (3) adding increases to the prices charged on the last day of the two 1950 calendar quarters.

3. Labor and material cost increases through Mar. 15, 1951, at the latest, were all that manufacturers could incorporate into ceilings under the original regulations. The amended orders advance date to July 26, 1951.

4. Only changes in the cost of factory labor and manufacturing materials could be used in calculating higher ceilings when CPR's 22 and 30 were first put out in April. The amendments allow most overhead cost increases, too, except where these are found to be "unreasonable or excessive."

Still excluded, however, are: Depreciation in excess of normal profit distributions under profit-sharing plans or as bonuses, interest, excess expense accounts or entertainment costs, income or profits taxes, inventory losses, charitable contributions in excess of those recognized by the income tax laws.



**KANAWHA RIVER PLANT of Appalachian Electric Co takes shape near Glascow, W. Va. The plant, which will be integrated with the American Gas & Electric Co system, will contain two 200,000 kw units and will cost an estimated $40 million**

## YIELDS (%) — Operating Electric Utility Securities

| Quality | Bonds 1st | Bonds 2nd | Bonds 3rd | Preferred Stocks 1st | Preferred Stocks 2nd | Preferred Stocks 3rd | Common Stocks 1st | Common Stocks 2nd | Common Stocks 3rd |
|---|---|---|---|---|---|---|---|---|---|
| DATE | | | | | | | | | |
| 1951 | | | | | | | | | |
| **Nov. 8** | **2.97** | **3.04** | **3.13** | **4.19** | **4.41** | **4.76** | **5.48** | **6.22** | **6.97** |
| Nov. 1 | 2.98 | 3.04 | 3.14 | 4.18 | 4.39 | 4.73 | 5.46 | 6.23 | 7.01 |
| END OF QTR. | | | | | | | | | |
| 3rd 1951 | 2.87 | 2.91 | 3.04 | 4.05 | 4.27 | 4.61 | 5.52 | 6.24 | 7.05 |
| 2nd 1951 | 3.02 | 3.11 | 3.23 | 4.11 | 4.37 | 4.68 | 5.73 | 6.38 | 7.78 |
| 1st 1951 | 2.87 | 2.93 | 3.00 | 3.96 | 4.19 | 4.52 | 5.47 | 6.20 | 7.13 |
| 4th 1950 | 2.65 | 2.67 | 2.78 | 3.86 | 4.14 | 4.51 | 5.80 | 6.54 | 7.44 |

Data: Reis & Chandler, Inc.

## Utility Operating Revenues in September Rise 9.2%

Electric operating revenues of the larger privately owned utilities in the United States in September totaled $442,302,000, according to preliminary figures announced by the Federal Power Commission. This figure represents an increase of 9.2% over revenues of $405,099,000 for September, 1950.

Gross income in September, including other utility operating income, amounted to $81,138,000, an increase of 1.6% for the month. Net income of $56,894,000 was almost unchanged from the $56,828,000 reported for September, 1950.

Revenue deductions, including operating expenses, depreciation, and taxes, were $367,177,000, or 10.5% over those for September, 1950.

## Town Seeks to Purchase Arkansas P&L Facilities

A committee of Mountain Home businessmen are leading a campaign for the purchase of distribution facilities of Arkansas Power & Light Co and the establishment of a municipal electric system. The company serves about 900 customers in this city.

City Attorney Tom Tinnon said 670 persons have signed a petition supporting the purchase. A public hearing will be held Nov. 26.

If the city could acquire these facilities, it could then buy power from the Norfork and Bull Shoals Dams direct from the government through the Southwestern Power Administration.

"The city can, through public support and a special election, buy the company's distribution facilities here, regardless of whether or not the company wants to sell," Tinnon declared.

However, the Arkansas law provides:

1. That revenue bonds cannot be issued for the purchase of electric and gas utilities.

2. In the event that the city votes for the issuance of mortgage bonds and the purchase of the property, the sale price would be fixed by the Arkansas Public Service Commission which is authorized also to grant severance damages to the company for the loss of this part of its system.

Buying these facilities would put the city in "the best position of any town in Arkansas to make a bid for industries," Tinnon said. Profits of the business "will allow us to make such needed improvements that the people want."

## FINANCIAL BRIEFS

**Common stockholders** of Long Island Lighting Co subscribed for 506,710 common shares (96.5%) of the 524,949 shares offered by the company at $13 on 1-for-7 basis. Balance of 18,239 shares was bought by Blyth & Co and First Boston Corp group . . . **Duke Power Co's** bus system in Charlotte, N. C. and six other cities in the Carolinas is being bought by L. A. Love, vice president and general manager of the Queen City Coach Co and a group of associates. Duke Power will have bus operations in only two cities, Anderson, S. C., and Greensboro, N. C.

## ELECTRIC UTILITY FINANCING

| Company | Description | Amount of Offering (000) | Offering Price | Yield at Price to Public |
|---|---|---|---|---|
| **Bonds** | **WEEK OF NOVEMBER 8-14** | | | |
| Florida Power & Light | 1st mtg, 3⅜% 1981 new money | $10,000 | 101.377% | 3.55% |
| Detroit Edison | gen and ref bonds, 3¼% 1976 new money | 40,000 | 101.783% | 3.27% |
| **Preferred Stock** | | | | |
| Commonwealth Edison | 1,716,500 sh, $1.32 cum conv, $25 par (to common holders on ratio of 1 sh pfd for each 8 common sh held on Oct. 30 to expire Nov. 14) | $42,913 | $31.00 | 4.26% |
| | **WEEK OF NOVEMBER 15-21** | | | |
| Gulf States Utilities | 1st mtg 1981 | $10,000 | ..... | ..... |
| | **SCHEDULED NOVEMBER-DECEMBER-JANUARY** | | | |
| **Bonds** | | | | **Bid Date** |
| Central Illinois Light | 1st mtg 1981 | $ 8,000 | | Nov. 27 |
| Long Island Lighting | 1st mtg 1976 | 25,000 | | Nov. 28 |
| Central Maine Power | 1st and gen mtg 1981 | 7,000 | | Dec. 5 |
| Virginia Electric & Power | 1st mtg 1981 | 20,000 | | Dec. 10 |
| Seattle, Wash. | mun l and p rev, 1962-1986 | 28,000 | | Jan. 8 |
| **Preferred Stock** | | | | |
| Northern Indiana Public Service | 240,000 sh, $25 par cum conv, into common sh-for-sh, preference stock (to common holders on 1-for-12½ sh basis, record Nov. 9 to expire Dec. 3) | $ 6,000 | ..... | ..... |
| **Common Stock** | | | | |
| Central Maine Power | 315,146 sh (to be offered to 6% pfd holders on 5-for-7 basis and to common holders on 1-for-7 basis; New England PS, parent and holder of 49% of common, waiving its right to subscribe for new common; price to be determined by competitive bidding) | ..... | ..... | Dec. 5 |
| | **UNSCHEDULED—UNDER CONSIDERATION** | | | |
| **Preferred Stock** | | | | |
| Central Hudson Gas & Electric | 40,000 sh $100 par cum pfd | $ 4,000 | ..... | ..... |
| **Common Stock** | | | | |
| Public Service Co of New Hampshire | 235,809 sh common | ..... | ..... | ..... |

## MEETINGS

**American Society of Mechanical Engineers**
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., November 26-30.

**Westinghouse Electric Corporation**
4-H Farm-Home Electric Program Conference, Hotel Stevens, Chicago, Ill., November 28.

**Pacific Coast Electrical Association**
Annual Hawaiian Conference, Royal Hawaiian Hotel, Honolulu, T. H., November 29-30.

**American Institute of Electrical Engineers**
Feedback Control Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., December 6-7; Computer Conference, Benjamin Franklin Hotel, Philadelphia, Pa., December 10-12; Winter General Meeting, Hotel Statler, New York, N. Y., January 21-25, 1952.

**Public Utilities Advertising Association**
Region 2 Meeting, Advertising Club of New York, New York, N. Y., December 7.

**Chicago Lighting Institute**
Industrial Production-Safety Lighting Clinic, Chicago Lighting Institute Auditorium, Chicago, Ill., December 7.

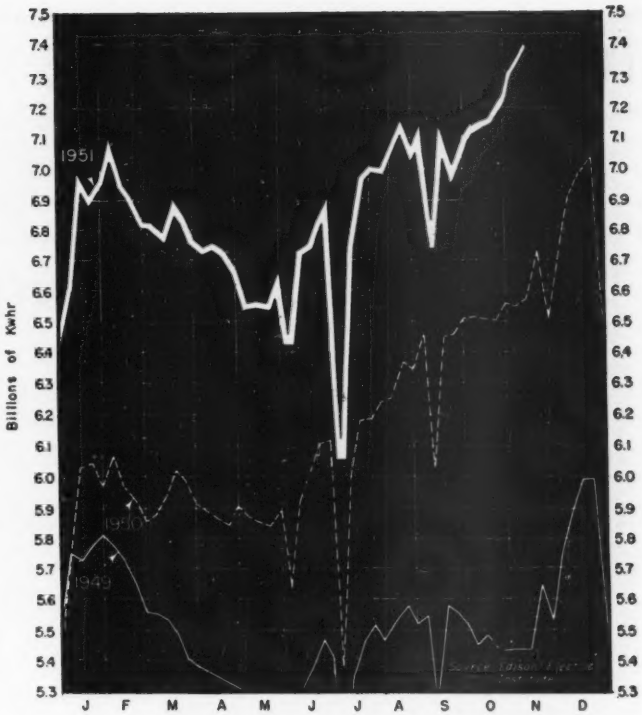
★**Instrument Society of America**
1952 Regional Power Plant Instrumentation Conference, New York Section, Hotel Statler, New York, N. Y., February 7-8, 1952.

★**Missouri Valley Electric Association**
Industrial-Commercial Sales Conference, Hotel President, Kansas City, Mo., February 7-8.

★**Public Information Program**
East North Central Region Meeting, Fort Wayne Hotel, Columbus, Ohio, February 19, 1952.

★**Pennsylvania Electric Association**
Winter Meeting, Relay Committee, Fort Stanwix Hotel, Johnstown, Pa., February 20-21, 1952; Prime Movers-Electrical Equipment Committees, Benjamin Franklin Hotel, Philadelphia, Pa., February 28-29, 1952.

★ Addition this week.




## Output Week Ended Nov. 10—7,396,115,000 Kwhr

| Weekly Output, Millions Kwhr | | | | | | Per Cent Change from Previous Year | | |
|---|---|---|---|---|---|---|---|---|
| 1951 | | 1950 | | 1949 | | | Nov 10 | Nov 3 | Oct 27 |
| Nov 10 | 7,396 | Nov 11 | 6,574 | Nov 12 | 5,435 | New England | + 6.6 | + 7.9 | + 4.4 |
| Nov 3 | 7,319 | Nov 4 | 6,551 | Nov 5 | 5,435 | Mid-Atlantic | +10.5 | +10.5 | + 7.5 |
| Oct 27 | 7,234 | Oct 28 | 6,563 | Oct 29 | 5,433 | Central Industrial | + 8.5 | + 7.6 | + 6.7 |
| Oct 20 | 7,149 | Oct 21 | 6,503 | Oct 22 | 5,430 | West Central | +11.3 | +13.2 | +11.7 |
| Oct 13 | 7,160 | Oct 14 | 6,509 | Oct 15 | 5,481 | Southeast | +18.7 | +16.4 | +14.0 |
| Oct 6 | 7,156 | Oct 7 | 6,514 | Oct 8 | 5,450 | South Central | +18.9 | +17.3 | +20.1 |
| Sept 29 | 7,102 | Sept 30 | 6,503 | Oct 1 | 5,521 | Rocky Mountain | +12.0 | +11.0 | + 9.6 |
| Sept 22 | 7,014 | Sept 23 | 6,457 | Sept 24 | 5,556 | Pacific Coast | +15.3 | +13.7 | +13.1 |
| Sept 15 | 7,138 | Sept 16 | 6,449 | Sept 17 | 5,579 | | | | |
| Sept 8 | 6,795 | Sept 9 | 6,029 | Sept 10 | 5,258 | Total United States | +12.5 | +11.7 | +10.2 |

## September Output Rises 9.1% Over Level for 1950

Production of energy by electric utilities in September reached a record high for the month of 30,275,324,000 kwhr, the Federal Power Commission reports. September output was 9.1% above the 27,749,143,000 kwhr produced during the same month last year, but 6.3% below the August, 1951, record total of 32,326,489,000 kwhr.

Production for the year ended Sept. 30, 1951, totaled 361,387,399,000 an increase of 14.6% over the 315,298,306,000 kwhr for the year ended Sept. 30, 1950, and 0.7% over the previous maximum set for the twelve months ended Aug. 31, 1951.

Water power plants produced 7,036,062,000 kwhr in September. This was 6.7% less than in September, 1950. As a per cent of the September total production, water power output decreased from 27.2% last year to 23.2% this year. Fuel plants produced 23,239,262,000 kwhr during September.

## 138-Kv Line Shorts Out, Causing Akron Blackout

A metallic substance or heavy stick falling across a 138-kv line in Portage, Ohio, was given by Ohio Edison Co engineers as the probable cause of a power blackout in the Akron area Nov. 5 that affected nearly a million persons.

The line, the engineers said, tripped out automatically three times shortly after 6 p. m. It was closed manually 15 minutes later, and operated normally thereafter.

The blackout lasted 25 minutes in downtown Akron and an hour and 20 minutes at Kent and vicinity.

Ohio Edison has a second 138-kv line under construction from Massillon to Akron, which is expected to give the city another source of power by the spring of 1952.

## Take-off Pattern Altered to By-pass Seattle Station

The air traffic pattern at Seattle's Boeing Field has been changed to keep planes as far as possible from a City Light substation handling 60% of the power coming into the city.

E. R. Hoffman, City Light superintendent, requested the change last spring after a B-50 crashed near the substation shortly after take-off. The station is one mile north of the field.

# WASHINGTON COMMENT

JESSE MOCK

Humiliating experiences suffered at the hands of government agencies and public bodies have made electrical workers' unions the most violent critics of public power. Representatives of both AFL and CIO-affiliated unions are writing a consistent record against further encroachment by public power.

To the outsider this may seem ironic since some of these same unions were among the most ardent supporters of public power in the '30's. But actually working under public power management has quickly converted them.

Organized electrical workers, probably more than any other group, have been exposed to the disastrous impact of public power. It is no wonder that their spokesmen can present some of the most convincing arguments being leveled against public power. They have learned the hard way and can talk in concrete terms which Congressmen and the public can understand.

### Government Management Tough on Unions

Testimony of these labor spokesmen and a large accumulation of evidence piled up by Congressional committees indicate the difficulties which face organized labor when a government body takes over. The union shop in nearly every case is abolished, and collective bargaining and the security that goes with it are tossed out the window. Wages fall below those paid by private companies in the area. Most workers lose Social Security coverage and some of the fringe benefits which their unions have won.

Where governments have invaded the power field, one union official said recently, "The rights of labor have been abrogated in whole or in part." All attempts to reverse the trend have met with "bitter and disillusioning" results.

The present federal administration has voiced loudly a near-paternalistic concern for the rights of labor. But when this same administration becomes the employer in the electric power field, it has chosen to ignore its own high-sounding phrases.

### Federal Law to Protect Workers Violated

Investigation of a Bureau of Reclamation transmission line project in Montana last year disclosed all sorts of irregularities in labor practices. Men were required to work Saturdays and Sundays with no extra pay. In a dangerous occupation, semi-skilled instead of highly skilled labor was used. And there were violations of the federal law which is supposed to protect the rights of workers on government projects.

These conditions lead a Senate committee investigator to report that Reclamation Bureau officials in charge had a "complete lack of understanding of the vital issues involved, plus a pious indifference . . . to what is taking place." So outrageous have been the labor practices under the Reclamation Bureau that New Deal Sen James E. Murray of Montana has privately called them the "worst labor record in existence." Despite his efforts to correct the practices, Murray thus far has received only pleasant promises.

Spokesmen for the unions have been busy this year acquainting Congress and other public bodies of the dangers inherent in public power operations. They have made some excellent presentations. Perhaps the time will come when they can convince their parent unions, the AFL and CIO, of these dangers (See UWUA-CIO story in news section).

# TECHNICAL NOTES

ARCHER E. KNOWLTON

**Transmission losses** as high as 25% in getting generation from new efficient units to consumptions have been found by calculating board studies; nearby but less efficient units proved more advantageous.

**Service risers** of wood through eaves of low-roofed houses are at best an impermanent form of installation.

**Architects and home-building contractors** should make sound provision for proper electric service entrance when they design and build ranch-type or bungalow homes with low eaves.

**Alarm** may or may not indicate that a generator should be tripped off; is the criterion for decision on the part of the operator clearly established?

**Socket meters** when pulled out from sockets under load have given no adverse experience on a system with several hundred thousand installations.

**Control** of boiler and turbine from different points is hardly centralization of control.

**Solid pole design** for generator rotors is considered abroad to give as good self-damping as a laminated pole piece with damper winding.

**Transmission cost** is less for 315 kv than for 345 kv primarily because double circuit construction is feasible at the lower voltage.

**Tools** are being sharpened in Hungary by being placed against a steel disk immersed in water glass and subjected to a current (tool-tip to wheel) which electrolyzes the cutting edge erosively.

**Reheat cycle efficiency** is 5 to 6% better at full load than for a non-reheat cycle but slightly poorer at ¼ load; good expected load factor is an important support for reheat.

**Higher loom speeds** and lower loom maintenance is following application of electronic controls.

**Natural gas meters** and pressure regulators are installed by one utility in cabinets with outdoor accessibility; why not the electric meters in the same or similar cabinets?

**CORRECTION** of TV interference begins with an examination by a company engineer of the nature of interfence on the receiver

# How to Locate and Stop TV Interference

**Most common causes of TV interference are easy to find and correct. Here the authors list most of the causes and cures for interference, describe equipment and methods used to locate interference sources, and suggest remedies for interference originating on power lines**

F. L. GREENE, The Ohio Power Co, Canton, Ohio
S. C. BARTLETT, American Gas and Electric Service Corp, New York

Television interference seldom comes from power sources. In fact, it has been shown* that power line equipment ranks ninth, in severity and nuisance, among sources of TV interference. Yet power companies today are spending a lot of time and money to study interference problems, make field tests, and establish beyond doubt that their equipment does not interfere with TV reception.

It is hoped that work being done by electric utilities to determine the causes and cures of interference will eventually be taken over by TV service men. Meanwhile, however, testing equipment and techniques have been developed that may be of value and interest to companies in areas where television is just being introduced.

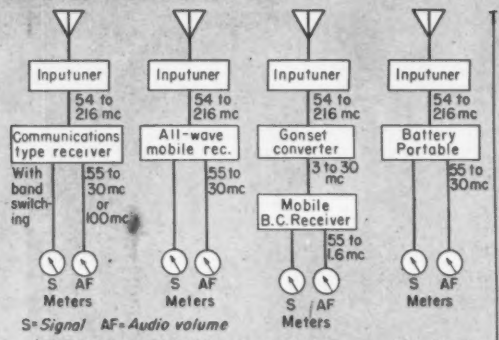
**Equipment Required . . .** For tracing interference a small passenger car is desirable, with equipment arranged so that one man can drive and operate the radio controls. There are advantages to arranging the car so that there is no outward evidence of its being used other than as a private car.

Suppression of car ignition noise,

* See "Television Interference Seldom Comes from Power Sources" by F. L. Greene, Electrical World, Jan. 16, 1950

# Elimination of interference requires accurate detection and proper construction

## Mobile detection arrangements

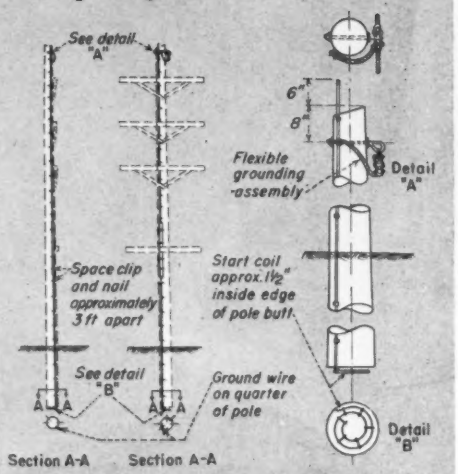



S = *Signal* AF = *Audio volume*

| 1st choice | 2nd choice | 3rd choice | 4th choice |
|---|---|---|---|
| Full coverage if communication receiver goes up to 54 mc or higher | Full coverage except 30 to 54 mc | Gap between 1.6 and 3 mc Also between 30 and 54 mc | Gap between 30 and 54 mc Tubes delicate, sensitive to filament voltage |
| Large mounting space required | Receiver may not be available | Small units conveniently mounted | |

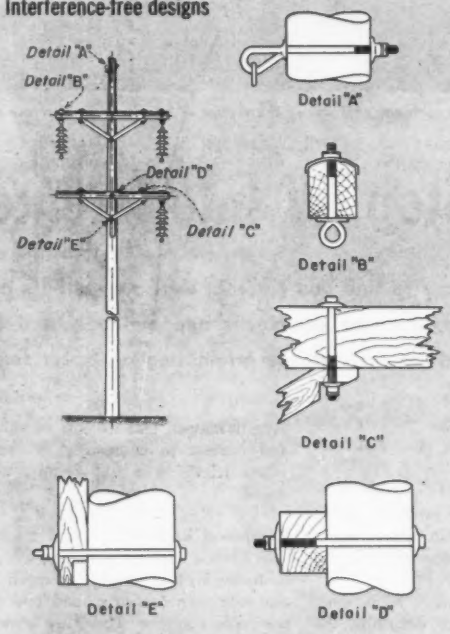
**Receiver circuits for use in interference investigations are shown with primary advantages and disadvantages**

## Good grounding scheme



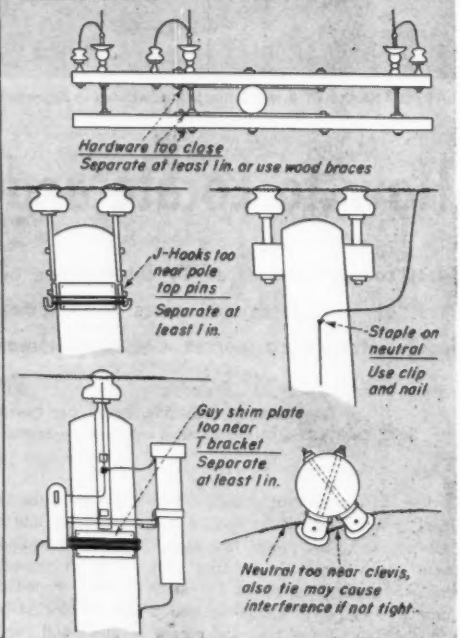

**Proper grounding methods used in line construction will serve to eliminate sources of interference**

## Interference-free designs



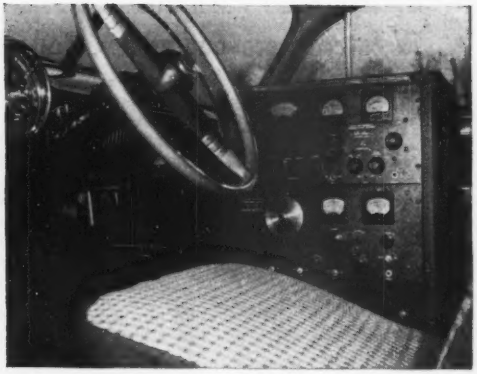

**Good line design plus attention to details during construction eliminates interference caused by power lines**

## Practices to avoid


Hardware too close
Separate at least 1 in. or use wood braces
J-Hooks too near pole top pins
Separate at least 1 in.
Staple on neutral
Use clip and nail
Guy shim plate too near T bracket
Separate at least 1 in.
Neutral too near clevis, also tie may cause interference if not tight

**These designs of line equipment on 6.9-kv. or higher circuits are potential causes of interference**

**DASHBOARD EQUIPMENT** also makes convenient arrangement. All devices are under or behind the dashboard



**CABINET REPLACES SEAT** in car making convenient arrangement so one man can drive and operate receiver at same time

usually quite a problem on the higher frequencies, may be accomplished by generous bonding and the use of suppressors. Resistor type spark plugs plus suppressors at the distributor cap or resistance type ignition wiring harness will help. The rotor inside the distributor gap may be either built up with solder or peened out to close the gap between the rotor blade and the fixed terminals. Bonding should include heavy connections between the hood and body of the car plus bonds between bulkhead and motor, and between all controls which enter the driving compartment and bulkhead. Engine performance is not adversely affected.

To prevent or eliminate tire static, graphite should be blown into the innertubes of all tires. A tool for handling this graphite application and packaged graphite sufficient for each tire is readily available.

Wheel static suppressors are usually available through the car dealer. They consist of a spring type unit for the front wheels and brush type for rear wheels.

Final clearing of ignition noises requires cut-and-try methods. Positioning of leads under the dash is important. Sometimes moving one of the leads under the dash or just shifting an antenna lead or another wire an inch or so will materially reduce the car interference pickup.

**Selection of Receivers . . .** To select the proper receiver, keep in mind the necessity of having continuous tuning through the AM broadcast band, 0.55 to 1.6 mc; FM broadcast, 88 to 108 mc; and TV channels 2 to 6, 54 to 88 mc and 7 to 13, 174 to 216 mc. Interference complaints received from amateur operators, police and county radio systems, and taxicab companies, and the interference at intermediate frequencies of TV receivers make it desirable to have continuous coverage from 0.55 to 216 mc.

**Preferred Receiver Arrangements . . .** Arrangements for four preferred type of receivers in the order of their preference are shown and compared in an accompanying sketch.

A television inputuner of the continuously variable type will extend coverage from 54 to 216mc. This should be modified by mounting on the chassis one stage of I.F. consisting of two I.F. "cans" tuned to 21.9 mc and a 6AG5 tube.

A plate supply unit is required for plate voltage to the high frequency tuner and whatever receivers do not have self-contained power supply units. Filaments, except on portable

**PRIVATE CAR APPEARANCE** for investigation cars has definite advantages. Cars are arranged to reduce car interference pickup. Here, service man answers call

## TV Interference Causes . . . And Their Cures

| | |
|---|---|
| Automobile ignition | —Move antenna as far from street as possible |
| Electric shaver | —Filter built into the device (not at plug end of line cord) |
| Oil Burner | —Spark plug suppressor, line filter, bonding motor, burner and furnace |
| Belt Static | —Bonding machines together and to ground. Applying graphite to belt |
| Defective neon signs | —Check insulation, replace tubes |
| Diathermy | —Old style sets using arc or self-rectifying oscillators require shielded room and line filter<br>New style may require adjustment to eliminate harmonic or other radiation |
| Commutating motors | —Filter at motor (not at plug end of line cord) |
| Oscillating TV booster | —Separate input and output leads, install shielding, neutralize |
| Pick-up from another TV receiver | —Provide shielding, improve front-end isolation, and use booster to isolate antenna at offending receiver |
| Pick-up of harmonic of same receiver's I.F. | —Install additional shielding or filters to keep video I. F., harmonic radiation, and reentry to a minimum |
| Industrial heating | —Temporary cure by moving frequency so as not to interfere with local channels. Complete cure involves shielded room and line filters |
| Mobile transmitter | —Reduce spurious emission by lower drive, loose coupling, additional traps |
| Aviation " | —Reduce spurious emission by lower drive, loose coupling, additional traps |
| Amateur " | —Reduce spurious emission by lower drive, loose coupling, additional traps, |
| Germicidal lamps | —Replace with 60-cycle type |
| Arc welders using RF to strike arc | —Complete shielding, line filters |
| Garage door opener (transmitter) | —Reduce power, shift frequency |
| Garage door opener (receiver) | —Replace super-regenerative receiver by non-radiating type |
| Thermostatic devices | —Condenser filter as close to contacts as possible |
| Defective door bell transformer | —Replace |
| Demand meter | —Condenser filter as close to contacts as possible |
| Tungsten lamps | —Replace |
| Loose antenna connections | —Tighten |
| Spot welders | —Filter usually available from manufacturer of machine |
| Electric fences | —Replace with newer type |
| Traffic lights | —Filter installed in controller |
| Blinker lights | —Filter installed in controller |
| Fluorescent lights and starters | —Replace |
| Power line equipment | —Accompanying sketches show pole-top equipment assembled in accordance with good engineering practice |
| Bushings | —Replace |
| Insulators, pin | —Replace |
| Insulators, dead-end | —Apply conducting grease to joints. Grease gun can be mounted on hot stick with bakelite shaft extension of screw, as shown |
| Tree contact | —Use heavy insulating sleeve on line wire, trim trees |
| Lightning arrestor | —Replace |
| Tie wires, insulated | —Clean conductor, use bare tie wire |

receivers, should be 6v and operated directly from the car battery.

**Other Equipment . . .** The antenna should preferably be of the rear or top mounting type. Spring mounting is preferred, with provision for fastening down with a hook when required.

Since the battery drain is heavy, an alternator-rectifier unit is used in place of the standard car generator. Absence of a commutator also simplifies the problem of noise reduction.

A loudspeaker, if not a part of the low frequency receiver, must be provided.

Meters, for reading relative signal strength and for reading audio volume, will be required.

A portable all-wave radio receiver is useful for tracing sources of random noise or interference on TV intermediate frequencies where it is impossible to take the car close to the source.

Also helpful are:

**1.** A portable TV receiver that can be carried to the customer's premises for a quick check to determine whether or not his receiver is in proper working condition.

**2.** A field strength meter or a tuned, calibrated voltmeter capable of reading signal levels at the antenna terminals of the customer's receiver.

**3.** An adjustable directional antenna designed so that it can be folded up for portability. Four 5-ft sections of 1½ in. hot sticks can be used for a mast.

Many arrangements are possible but basically two have proved most satisfactory. One has receiving equipment mounted in a cabinet which takes the place of the right front seat in the car. The second arrangement has all devices under or behind the dashboard, including the power supply unit.

**Characteristics of Interference Sources . . .** Many types of interference produce similar patterns on the screen. Eight basic forms are:

**1. Ignition type**—Motor vehicle, electric shaver, oil burner, belt static, and defective neon sign lighting. Motor vehicle interference produces separate pulses varying in frequency with engine speed. The shaver produces a steady roar, while it lasts. Oil burners produce a simi-

lar roar with noticeable 60-cycle tone but cycle "on" and "off" at intervals. Motor belts produce regular bursts of noise. Defective neon signs produce a steady roar with 60-cycle background and show up as bands or streaks on the screen.

**2. Diathermy**—Old-type diathermy causes characteristic RF distortion of the picture accompanied by 60-cycle roar. Under new FCC rules these devices must be discontinued by Jan 1, 1952.

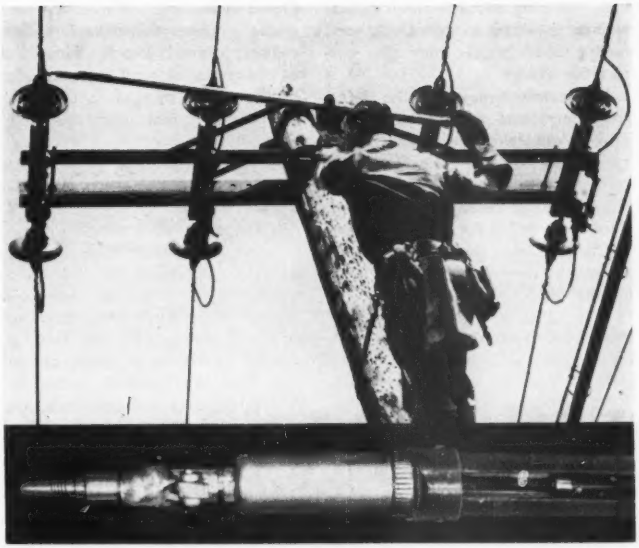
**3. Commutators** — Mixers, sewing machines, cash registers, converters, adding machines, and portable tools all produce sounds similar to commutator scream. For a clue to the source watch speed changes and duration of run.

**4. RF type**—Other TV receivers or from within the receiver being investigated, industrial heating, mobile transmitter, aviation, amateur, and certain types of germicidal lamps and arc welders that use radio frequency to strike the arc. All produce a characteristic snake pattern which usually shifts rapidly in angle all the way from horizontal to vertical and back unless the interfering signal happens to be crystal controlled. Very strong signals may cause picture inversion. The first, second, and third types produce no sound but the fourth may. All others are either modulated or keyed so that they are practically self-identifying.

**5. Thermostatic devices** — Heating pads, butter conditioners in refrigerators, defective door bell transformers, water heaters for chickens, water heaters for aquariums. These all produce a similar frying noise at more or less regular intervals. Some demand meters have a contact which may arc for irregular periods producing interference exactly like thermostatic devices.

**6. Old style tungsten filament lamps** —Interference is produced only by old style lamps with open "W" filament. The frequency is concentrated in a narrow band usually interfering on only one TV channel. The sound produced is a rasping 60-cycle tone.

**7. Momentary contact**—Loose antenna connections, spot welders, electric fence, traffic lights, blinker lights, defective fluorescent lights, and starters. All produce a momentary flash possibly destroying the picture and knocking it out of synchronism accompanied by a thump in the speaker. Regularity, rate, and duration are clues.



**CONDUCTING GREASE applied with hot stick grease gun to joints on insulators and dead ends eliminates interference from these sources. Grease gun can be mounted on hot stick with bakelite shaft extension of screw for application of conducting grease to insulators and dead ends**

**8. Power line equipment**—Not a major cause of interference. Loose hardware, cutouts, fuses, ungrounded metal arcing to grounded objects, defective line insulators and bushings, defective lightning arresters, wire in contact with tree or crossarm all produce pictures similar to the ignition type except for a tendency to concentrate in two horizontal bands and accompanied by a characteristic 60-cycle buzz, or frying noise.

Screen samples and a more complete discussion of these types appeared in the article in the January 16, 1950 issue of Electrical World.

**Unusual Cases . . .** There are unusual conditions, outside the eight basic interference forms.

Midget receivers have been found with parasitic oscillation taking place in the audio output stage and falling into the TV channel. The RF signal produced may cover considerable distance since this stage is capable of relatively high power output. Audio quality on the offending AM set may not be affected materially. The cure is the addition of a mica type by-pass on the plate terminal of output tube or a resistor type suppressor in series with grid or plate leads or both.

Another infrequent example is the case of AM or FM police, taxicab, or utility space radio where any multiple of crystal frequency other than that used to produce fundamental output frequency may beat with the television video or sound carrier to produce the I.F. of the TV receiver, thus affecting the picture the same as any R.F. signal. The cure is additional tuned circuits ahead of transmitter output tube or a sharply tuned output filter of the cavity resonator bazooka or M derived type.

Space radio services, police, fire, utility, and others, as well as broadcast and amateur radio operators are often accused unfairly in cases of television interference. For instance, due to the susceptibility of the television front-end tuning system, the fundamental or licensed output frequency may shock excite, or block the first tube in the television set through no fault of the transmitting equipment, and remedial measures can be taken at the TV receiver only. A good

high pass filter added to the television receiver is often indicated. A good double-tuned booster may also correct the trouble.

Where transmitters may be defective, harmonics or spurious output falling into television channels can easily be detected by engineers equipped with mobile all-channel continuous-tuning receiving equipment. Those responsible for the transmitters which have been causing interference are usually most cooperative in clearing the trouble.

**Processing Complaints . . .** As much information as possible should be gleaned from the complainant when TV interference complaints are received to obtain some idea of the trouble. Find out if possible the nature of interference, whether adjacent sets are affected similarly, telephone number, and hours available at home. A log of essential data, including time on and off, duration or cycling time, gives good clues of the type and kind of interference.

**Conduct of Field Test . . .** Assuming that the customer's equipment is normal, properly tuned, and that there is definite evidence of interference, the engineer notes its character and proceeds with the field tests as follows:

First, see that equipment in the car is tuned to the "interference channel" and controls adjusted for a satisfactory meter reading and speaker volume. If the signal is of the RF type it will show only on the "S" (signal) meter, with no sound unless modulated. If of the random noise type there will probably be little indication on the "S" meter and it is here that the audio meter comes into play.

Next, proceed away from the customer's location, watch signal level. If necessary go in the reverse direction, but locate the area of maximum signal. Having completed, say the north-south direction, survey the east-west direction from the area of maximum signal, going again north and south if necessary, but always seeking the area of greatest signal. To narrow the source down to an individual house it may be necessary to enter driveways. Indecision regarding houses on opposite sides of the street frequently can be cleared by observing whether passing vehicles interrupt the signal.

**Found In Home . . .** When the investigation indicates a specific house the engineer should identify himself to its occupants. A good approach after explaining the mission, is to suggest the possibility that equipment in the home, wiring, switches, or appliances may be defective. Ask permission to check, if the device suspected is not already obvious.

If the main switch must be opened to prove interference is on the property get permission first. If interference stops when the switch is opened momentarily the individual piece of equipment can then be checked by turning off appliances one at a time. For random noises, the portable receiver will sometimes lead to the source without shutting down any appliances.

**In Factories . . .** Trails leading to factories can be followed to the specific devices with little trouble. If it is of the RF type such as industrial heating, or momentary contact type such as spot welders, the manager will know what equipment is in use and where it is located and arrangements can be made for a trial interruption. Assuming that the noise is not of the old style tungsten lamp or RF type, all other sources produce random type noise which can be readily run down with the portable receiver.

**On Power Systems . . .** TV interference within the power system may be traced to the specific piece of equipment by the same methods which have been used for radio interference work since most all sources produce a random type noise and cover a wide band of frequencies including broadcast, short wave, FM, and TV. Conventional sledge hammer treatment is still valid for pinpointing specific poles which may have loose or defective equipment.

There are various bandwidths covered by random noise. For example, hardware noise usually affects frequencies from below broadcast through FM and TV. Ignition noise which does not interfere to any extent on broadcast and lower frequencies has a rising characteristic at frequencies higher than broadcast, peaking around 30 mc, so that the low TV channels are materially affected. But high TV channels are considerably less affected.

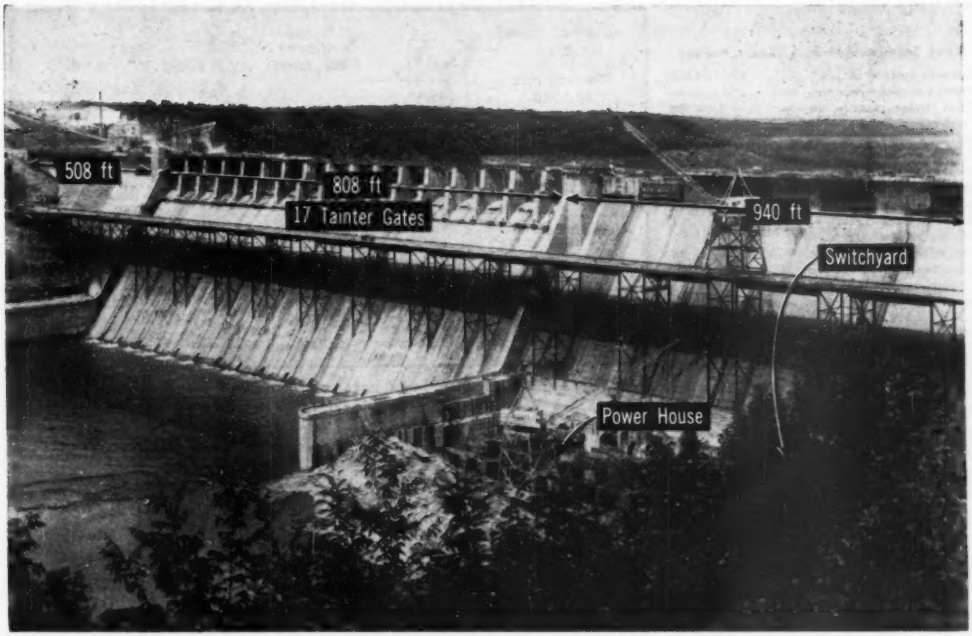
In primary TV areas random noise reported on TV reception coming from power lines or associated line equipment practically always affects radio reception also and radio complaints as well as TV complaints would be received from the affected area. However in fringe and deep fringe areas, insulated conductor and tie wires, some cracked pin-type insulators, and suspension-type insulators with corroded or rusted pin and socket joints create random noise peaking in the higher frequencies to the extent that TV complaints only are received with no effect reported or noticed on the standard broadcast band. Testing or patrolling with the mobile equipment, where these conditions prevail, show interference of a rather constant level, frying noise on the higher frequencies including TV channels whereas no similar noise will be detected on the standard broadcast band, even with high sensitivity settings. On the TV screen the effect is the same as that described under the power system section of the discussion of basic forms of interference.

**Report to Customer . . .** Having determined beyond any doubt the source of interference, contact the owner of the device, explain the situation, and suggest that his service man be called in. Corrective devices are generally available and their installation understood by service people. If requested, the utility may offer suggestions and check results.

**Conclusion . . .** In areas where TV sets are in general use, it has been found that the total of television plus radio complaints is not greatly different from the total of radio complaints in non-television areas of equal number of customers. Also, television interference and broadcast interference frequently arise from the same source of disturbance.

The eye is much more critical than the ear so much better signal-to-noise ratios are required. Also, the TV receiver selectivity is of necessity very broad, consequently requiring better suppression of disturbances which affect television reception.

It is usually easier to trace sources of television interference than radio interference, since direct radiation is involved in practically all cases where television trouble is encountered.




**BULL SHOALS DAM** which will be the most massive concrete dam yet constructed by the Corps of Engineers, is nearing completion. Power house construction is in the right, foreground. Photo courtesy Little Rock District, Corps of Engineers

# Develop 160,000 Kw On White River At Bull Shoals

**Initial installation of four units, 160,000 kw, to be increased to eight as loads grow. Most massive concrete dam yet built by Corps of Engineers. Move all or parts of four towns, 54 cemeteries to make way for reservoir**

**LOUIS E. BONA, Assistant Chief, Design Branch**
**THOMAS B. LEWIS, Electrical Engineer, Design Branch**
**Little Rock District, Corps of Engineers, Little Rock, Arkansas**

Hydro capacity of 160,000 kw is being developed at the Bull Shoals project of the Corps of Engineers on the White River in northern Arkansas. Nearing completion now, Bull Shoals is about 10 mi south of the Missouri-Arkansas state line and 110 air line mi north of the city of Little Rock. It is 419 mi upstream from the confluence of the White with the Mississippi River.

Upon its completion Bull Shoals will be the most massive concrete dam yet constructed by the Corps of Engineers and will rank among the largest concrete dams in the United States. It will be a key unit in a system of reservoir projects for control and development of White River and its tributaries. Its primary purposes are for the control of floods and the development of hydroelectric power. It controls the runoff of over 6,000 sq mi of drainage area.

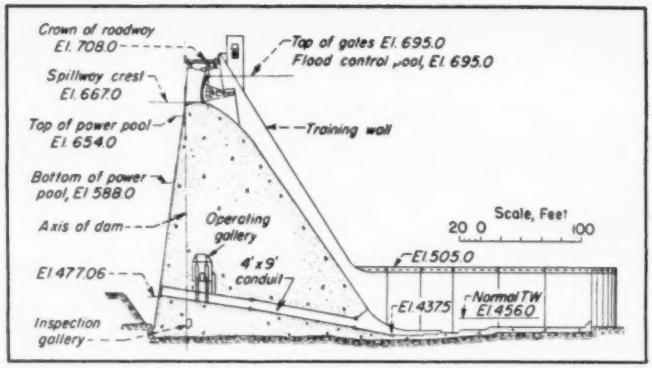
Of the 5,400,000 acre-ft of storage available, 2,360,000 acre-ft are reserved exclusively for flood control.

Four generating units of 40,000-kw capacity each are being installed at the present time. Space is being provided for four additional units.

Average stream flow at the dam site for 22 yr of actual record was 6,500 cfs. Average weekly flows varied from 112 to 136,000 cfs. With the storage capacity of 2,084,000 acre-ft allocated

**Vital Statistics of Bull Shoals Project**

| | |
|---|---|
| Drainage area, sq mi | 6,036 |
| Average annual stream flow, cfs | 6,500 |
| Total storage capacity, acre-feet | 5,408,000 |
| Flood-control storage, acre-feet | 2,360,000 |
| Maximum height of dam, ft | 285 |
| Crest length of dam, ft | 2,256 |
| Total concrete, cu yd | 2,000,000 |
| Net length of spillway, ft | 680 |
| Radial crest gates, each 40 by 28 ft | 17 |
| Discharge conduits, each 4 by 9 ft | 16 |
| Number of penstocks | 8 |
| Size of penstocks, diameter, ft | 18 |
| Gross head, power pool full, ft | 198 |
| Turbines to be installed, initially | 4 |
| Rated best gate capacity of each turbine at 190-ft head, hp | 52,000 |
| Generator rating, at 0.95 pf, kva | 42,100 |
| Installed capacity, initial, kw | 160,000 |
| Average annual energy output, kwhr | 685,000,000 |




**CONCRETE stepped stilling basin extends downstream from toe. Sixteen conduits are provided in the base of the spillway section for diversion during construction**

# Completion of dam will open new sources of power for hitherto

for power draw-down the stream flow could have been regulated to provide an average flow of 4,700 cfs during the most critical hydro period of past record. This flow will permit generation of 54,700 kw of prime continuous power. Total energy available in an average year will be 685,000,000 kwhr. The additional stream flow regulation resulting from construction of an upstream project at Table Rock will increase the primary power output at Bull Shoals by approximately 25%. Table Rock project is now in the planning stage.

Pertinent data on the Bull Shoals project are shown in the table.

**Construction . . .** A standard gage railroad spur 17 mi in length was constructed from the tracks of the Missouri Pacific Railroad at Cotter, Ark., for construction purposes. Construction of the dam is 97% complete and completion of the dam is scheduled for this November. Power generation from the first unit is scheduled for March 1952 with the second, third, and fourth units scheduled for operation in about 60-day consecutive periods thereafter.

**Dam . . .** The dam is 2,576 ft long at the top and maximum height is 285 ft. It is a straight concrete gravity-type structure containing 2,000,000 cu yd of concrete.

An overflow spillway with radial-type steel spillway gates is provided near the right abutment and is flanked by non-overflow sections extending into each abutment. Sixteen conduits are provided in the base of the spillway section with hydraulically operated sluice gates for diversion during construction and later to control the flow of floodwaters. A concrete stepped-type stilling basin extends immediately downstream from the toe of the spillway.

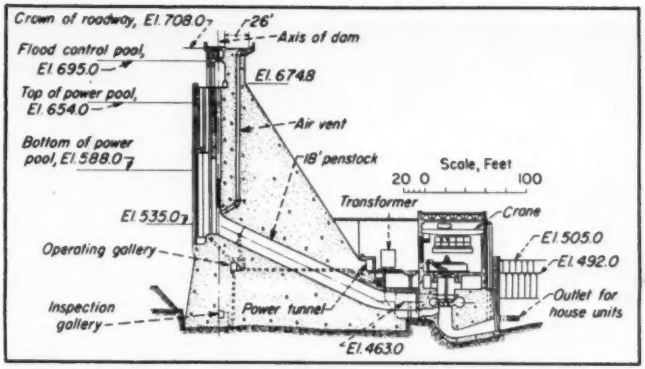
The dam contains two main galleries. One is for inspection, drainage, and grouting. The other is for access to the conduit gate operating chambers.

Eight penstocks having a diameter of 18 ft and spaced on 54-ft centers are installed through the non-overflow section immediately to the left of the spillway. Penstocks are lined with steel plate varying in thickness from 13/16-in. to 1 1/16-in. In order to close the intake and permit entrance to the penstock and turbine for inspection and maintenance, a tractor type gate is being provided in each of the four penstocks to be used in the initial installation. Intakes of the other four penstocks are sealed by hemispherical steel bulkheads which will be removed as additional units are added.

**Powerhouse . . .** A conventional reinforced concrete and structural steel indoor-type power house large enough to house eight units is being constructed at the downstream toe of the dam and to the left of the spillway. Only four of the main units are being installed at this time. Additional units will be installed as needed in the spaces provided in the powerhouse.

An erection bay and machine shop are provided at the left end of the powerhouse with direct access from the construction railroad in order to simplify erection of units. Offices and control room are located at the powerhouse in the area between the generator bay and the downstream face of the dam. A clearance of 8 ft between the powerhouse foundation and the toe of the dam allows for the effects of differential movement between the two structures. There are two single-trolley cranes for the main powerhouse. Both cranes will be required occasionally to lift a generator rotor but one crane is sufficient to lift all other loads.

**Turbines and Generators . . .** Four Francis-type turbines are each rated 52,000 hp at or near best efficiency when operating under a net effective head of 190 ft. Scroll cases are of welded steel construction and will be subjected to variable head ranging from 132 ft to 239 ft. Selection of turbine rating was based on studies involving expected operating conditions and on the criterion of selection of the largest sized turbine which could be accommodated in a 54-ft spacing as determined by the spacing of penstock monoliths in the dam.




**MAXIMUM HEIGHT of the dam will be 285 ft and there will be eight penstocks each 18 ft in diameter. Four generators are to be installed now and four later**

## isolated region of Great Ozarks Plateau

Generators are of the vertical-shaft water wheel driven type with thrust and guide bearings and direct-connected main and pilot exciters. Ratings are 42,100 kva, 0.95 power factor, 60-cycle, 3-phase, 13,900 v. They will operate at a speed of 128.6 rpm. The specifications require that the flywheel effect ($WR^2$) of rotating parts of the generators and exciters shall be not less than 34,000,000 lb ft squared. The stator winding is insulated with full Class B insulation and the rotor is designed for a maximum run-away speed of 252 rpm. The generator is provided with a closed air recirculating cooling system. Characteristics of the generators are such that no neutral resistors or reactors are required. Generator neutrals are grounded solidly through air circuit breakers.

**Generator Leads . . .** Generator leads are of the completely enclosed, isolated-phase type. They are designed to withstand the mechanical stresses caused by 50,000 rms amp flowing phase-to-phase for one sec. Conductors are of copper, designed to carry when enclosed a total current of 2,500 amperes. Conductors are supported within water-tight aluminum metal housing by high grade, wet-processed porcelain insulators on 8-ft centers.

**Station Service . . .** Two small hydroelectric units each of 1,000-kw capacity and each connected to a 5-ft diameter steel penstock constructed through the dam are being installed to provide station service power. This method was selected because it is entirely independent of the main units and the transmission lines which results in greater reliability of service. These turbines are rated 1500 hp when operating at 600 rpm under a net head of 165 ft. The generators are rated at 1,250 kva, 0.8 power factor and 480 v. The units are designed with sufficient flywheel effect to provide satisfactory operation for station use.

Oil-filled, pipe-type cables form the main 161-kv leads from the transformers to the switchyard. These cables are inclosed in a 6⅝-in. diameter pipe which will be filled with oil and maintained under a pressure of 200 psi. They vary in length from 500 to 800 ft and are carried in an underground concrete tunnel between the powerhouse and switchyard.

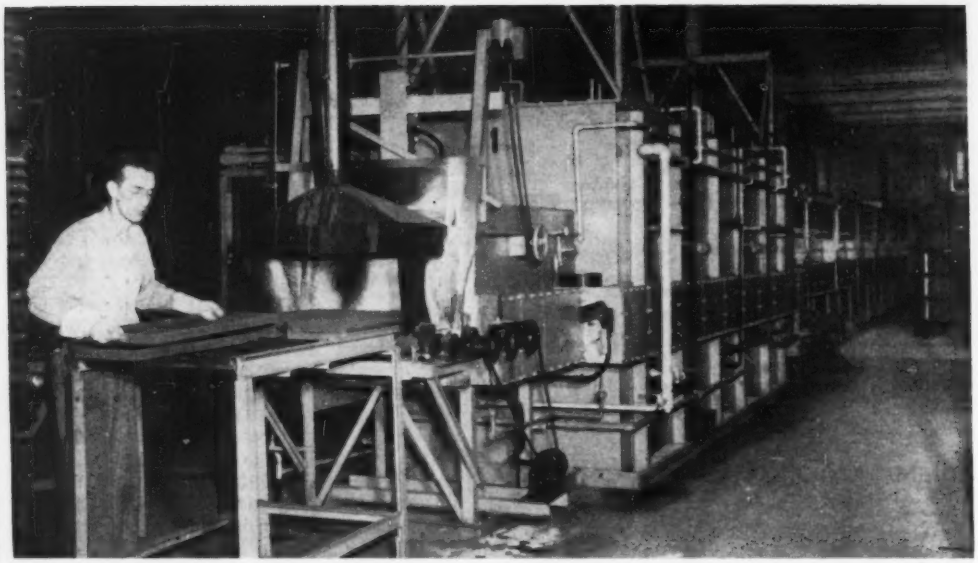
The switchyard is located at the base of the left abutment downstream from the powerhouse. The initial construction provides for 6 line bays and 4 generator bays of which one is for future use. Provisions are made for extension of the switchyard when needed. The switchyard will have a main and an auxiliary 161-kv bus, and will have the conventional "breaker-and-a-half" switching scheme. The breakers are rated at 161 kv, 1,200 amp, and will have an interrupting capacity of 3,500,000 kva. Transmission lines connecting to the switchyard are being constructed by power companies and the Southwestern Power Administration. Marketing of the power from the project will be by the Southwestern Power Administration.

**Transformers and Switchyard . . .** Main power transformers are being installed on the deck between the powerhouse and the dam. This location was selected principally because of convenience, economy, and short low-tension leads.

Transformers are of the oil-immersed, inert-gas filled, forced-oil cooled, forced-water type. Units No. 1 and No. 2 are each being connected directly to a 3-phase, 48,000 kva, 161,000/13,200v transformer and Units No. 3 and No. 4 are being connected to a transformer bank consisting of 3 single-phase, 32,000-kva, 161,000/13,200v transformers. Studies had indicated that some savings could be made by having two units on one transformer bank, but owing to the greater flexibility of operation it was considered desirable to connect the first two units to separate banks.

Transformers are furnished with oil-to-water heat exchangers located in a gallery in the powerhouse below the transformers with cooling water to be taken from the penstocks. This location facilitates maintenance and prevents freezing of the water.

**Reservoir Clearing . . .** The reservoir area is divided into five lots for clearing and except for very steep-sloped areas, is completely cleared in a strip from elevation 654, top of power pool, to elevation 620. Below the lower level all trees or portions of trees which extend above elevation 620 are being removed. At designated recreational areas the lower limit of complete strip clearing is extended down to elevation 590. There were 54 cemeteries in the reservoir area from which about 3,200 graves were removed and relocated at suitable sites selected and approved by the relatives of those buried in the cemeteries. Several county roads were affected by the reservoir and are being relocated. Six state highways are in the reservoir area and require relocation. The towns of Forsyth, Protem, and Kissee Mills, Mo., and Lead Hill, Ark., are affected and parts or all of these are being moved to nearby locations.



ROLLER-HEARTH FURNACE (320 kw) used for copper brazing evaporators for refrigerators has protective atmosphere which brings parts out with clean surfaces. Maintenance costs are lower than with gas-fired furnace. Rollers cut handling cost

# What Are The Cost Factors In Electric vs Gas Furnace Operations?

**Tests and more detailed overall cost studies of major furnace applications can help power engineers sell more electric furnace jobs. Many jobs today are going to gas which could be electric if more complete information on all cost factors were available.**

A. D. SPILLMAN, Supervisor, Market Studies & Service Division
Philadelphia Electric Co

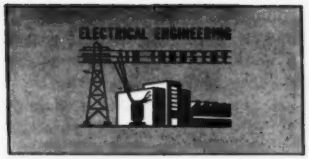
Analysis of the economics of electric vs gas-fired furnace application involves many inherent characteristics of these two types of furnace equipment. Electric furnaces have such well-known advantages as absence of products of combustion, accurate temperature control, ability to produce quality product, minimum amount of rejects, good working conditions, low maintenance, and reliable performance as furnace performance economy refers to the lowest heating cost per unit of finished product, it involves cost of the heating medium, labor, maintenance, depreciation, interest on investment, and cost of rejected parts.

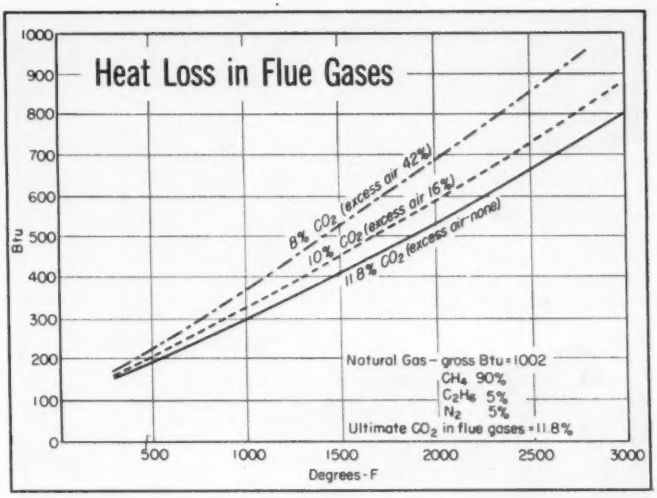
Adapated from paper presented at recent meeting of Interstate Power Club.

**Thermal Efficiency Low . . .** From the standpoint of thermal efficiency alone, this is essentially a ratio of the heat put into the charge, to the total heat units input to the furnace. Of the total heat generated in a gas combustion chamber only a small part is transferred to the charge. Part of it is necessary to heat the furnace lining, some is lost by radiation and convection, some through furnace doors and openings, and a very appreciable amount passes out of the furnace as sensible heat in the product of combustion or as unburned gases.

The accompanying curve is plotted for a natural gas of the following analysis: $CH_4$ 90%, $C_2H_6$ 5%, and $N_2$ 5% and of 1002 Btu per cu ft.

Consider a drawing furnace operating at 1200F. Under perfect combustion conditions about 300 Btu per cu ft of gas burned are lost in the flue products—representing a loss of 30% of the heat units. With a cast iron enameling furnace operating at 1350F the loss is about 370 Btu per cu ft or 37%. For a heat-treating furnace operating at 1600F the loss is about 440 Btu per cu ft or 44%. For high




speed steels, or forging, if the furnace temperature were 2300F the flue loss would be about 610 Btu, or 61% under perfect combustion conditions. All of the above cases are based on an ultimate of 11.8% $CO_2$ in the flue gases.

**Consider Stack Losses . . .** In a gas furnace, vents must be provided to take the products away in order to prevent back pressure, to make room for new products of combustion if specific temperatures are to be maintained and the charge heated. Likewise these unavoidable stack losses are incurred because some excess air must be supplied to provide for safe combustion. Another factor depends on venting. If the furnace has overventilation, the losses are increased.

Thermal efficiency is of little significance unless such other factors as continuity of operation and loading of the furnace are carefully considered. Infrequent use of a furnace necessitates more preheating and small loads require a relatively small amount of heat compared to the other overall requirements. Hence under such conditions the operations would be inefficient, running as low as 10% or less.

**Consider All Factors . . .** As has been said, it is important to consider other factors which are influenced by the heat source used and the product treated. Among these are:

1. Product quality and uniformity
2. Operations required after heating—such as cleaning, straightening
3. Ability to locate furnace equipment in line of production flow
4. Good working conditions. Low labor cost through use of automatic features and conveyor systems
5. Dependable performance, low maintenance, and fewer shut-downs contribute to greater production.
6. Fewer customer complaints because of better and consistent quality of product

Most customers need help in making such cost analyses. This means that the power companies and the manufacturers of electric furnace equipment should spend more time—now and in the future—with customers to complete detailed studies where a major electric heating application is involved.

**Electrical Industry Leads . . .** In promoting use of electric furnaces the electric industry is in the lead. Recognition is given this fact by the gas industry, even to the extent that for every fuel or combustion engineer there are at least ten electrical engineers.

The gas industry is continually directing attention to the effective promotional work done by the electrical industry in the face of terrific odds on a heat energy basis as compared with gas as fuel. However, to maintain this place and continue to improve and "outsell" competition of other fuels, it is essential that a greater number of cost studies be made. These would be along the same lines as those made for brazing, malleable iron annealing, porcelain enameling, heat-treating in controlled atmospheres or with the use of salt baths. More recently, for example, we have seen information on electric galvanizing and the heat application in the production of electrolytic tinplate.

The Industrial Furnace Manufacturers Association, composed of a membership of over 80% of electric and fuel-fired furnace manufacturers (exclusive of melting furnaces), reports that of the dollar volume of furnaces sold in 1949 over 45% were electric, in 1950 about 38% were electric, and in 1951 up to and including July 41% were electric. We find also that some plants, small and large, use more power for industrial process heating than for all of their other electrical uses.

**High Temperature Melting . . .** In the high temperature melting field acceptance of electric arc melting extends beyond the high priced alloy steels down into the once considered uneconomical field of melting ordinary carbon steels. From 1940 to 1950 electric arc melting furnace capacity more than tripled, even in competition with some gas or oil-fired open hearths.

Turning to specific cases consider, for example, both electric and gas-fired porcelain enameling furnaces. Two of these installations, in plants located in a suburban area where Philadelphia Electric Co supplies both gas and electric service, consist of continuous conveyor type furnaces—one gas and the other electric. The gas installation consisted of a U-travel muffle-type furnace equipped with two large power burners compared with the electric installation which, of course, had no muffle and was of the heat-seal counter-flow type.

The gas furnace was used for enameling both black and white en-

**SALT BATH FURNACE (90 kw) used for hardening pneumatic rock bits and paving breaker tools provides accurate temperature control impossible with the previously used gas furnace. Hardness is held within a few points of the Rockwell scale. Fewer rejects, a better product, and operating cost less than estimated are benefits**

ameled range parts and fitted in with the customer's decision to use gas for pickling and rinsing of metal parts in preparation for enameling, plus the use of gas dryers.

The second customer decided on electric resistance-type furnaces for the production of sinks, bath tubs, and other white enamel ware, not because of lower investment and operating costs, but because of more reliable performance, better temperature control, and lower maintenance. Further considerations of importance to them included: Less chance of shut-down, less danger of spoilage of ware and of loss of production. In this case we made numerous cost comparisons showing electric, gas, and oil costs and the final decision provided for the installation of an 85 ft, 1200-kw ground cost enameling furnace and a 120 ft, 1855-kw cover cost furnace.

**Some Test Results . . .** Tests on these furnaces showed these results:

Ground cost enameling on 66 in. sinks weighing 62 lb each. The average gross weight per kwhr was 18.8 lb, the furnace temperature being approximately 1500F. Production averaged 163 pieces per hr. Gas requirements for similar operations with radiant tube furnaces may range from 13.5 to 16.5 cu ft of 530 Btu per equivalent kwhr consumption.

Finish coat on the same sinks and on wash tubs. Average weight per kwhr was 22.2 lb.

These are consistent with other test data for enameling of this kind, and even in view of a 10% lower cost of gas over electric heat, electric furnace operation can still be considered less expensive because of higher gas furnace maintenance and tube replacement costs, and because of a substantial reduction in loss of production due to furnace shut-down.

Where muffles are used on gas furnaces the relative efficiency is decidedly more in favor of the electric furnace and the overall economy including muffle replacement amounting to from $1500 to $5000 per year further offset fuel cost differentials. Likewise with muffle furnaces it is generally considered good practice to maintain a minimum temperature of possibly 1200F during idle periods.

For such enameling operations when furnace temperatures are 1500F the heat lost in flue gases would be about 42% as shown on the curve.

In Philadelphia in competition with gas and oil for a somewhat similar continuous enameling furnace the customer finally decided in favor of electric furnaces. One is 1200 kw and the other 1500 kw. These are being used for enameling washing machines, dishwashers, sinks, and other enameled products. In these analyses the relative economy figures on a monthly basis were 313,140 kwhr versus 4,227,000 cu ft of 530 Btu gas. The incremental electric cost of this additional load was $2,519 per month. With gas at 60¢ per 1000 cu ft the cost was $2,536 (radiant tube installation), and with oil at 8¢ per gallon $2,036.64 (muffle type furnace). It is also interesting to note that the 1200-kw furnace would raise the power factor from 91% to over 95%.

In the field of malleable iron we find the following comparative cost factors:

In gas furnaces up to 10,000 cu ft (530 Btu gas) per net ton of malleable castings are required as compared with up to 400 kwhr per net ton of malleable castings when using electric furnaces. This results in better than 25 cu ft of gas as equivalent to 1 kwhr.

If the gas rate is 55¢ per 1000 cu ft the cost of gas would be $5.50 per ton vs possibly $4.00 per ton for electricity at 1¢ per kwhr. However, based on experience, the maintenance of electric furnace equipment runs about $1.00 per ton less than gas furnaces, exclusive of any cost allowance for loss of production. A large part of this difference in maintenance is due to tube replacement costs which at the same time puts the furnace out of production. In addition such other costs as heavy pots used in fuel-fired furnaces may add as much as $4 to $6 per ton annealed.

Other important factors, aside from energy and maintenance costs, are labor, better working conditions, shorter time cycles which with electric furnaces have been reduced to 24 or 36 hr at the high temperature operation. This is then followed by a low temperature, or drawing treatment.

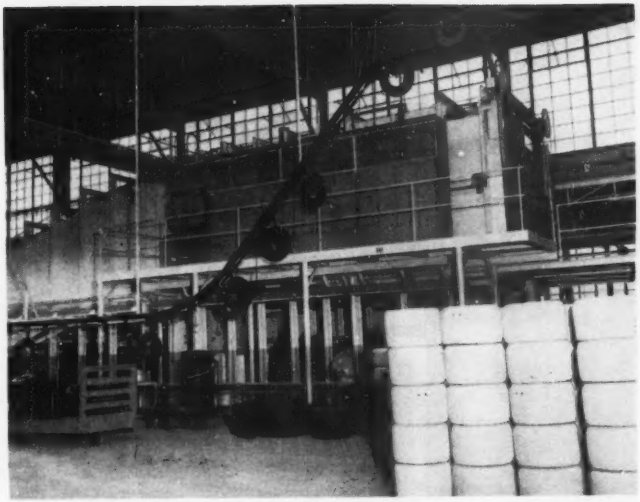
**Heat-Treating . . .** In heat-treating there is a very extensive field of furnace applications. One type of furnace, by way of illustration, has proven successful and economical.

The electric salt bath has the advantage in generating heat within the salt bath and in addition the electromagnetic motion created within the

bath imparts a very desirable circulating effect. These and other inherent factors contribute to close temperature control, ±5F and the consequent ability to reproduce identical results in quality of product.

Here are some cost comparisons which will be of interest as they relate to a cyaniding operation at 1550F.

With 1000 Btu gas, available at 31¢ per 1000 cu ft and electricity at 1.1¢ per kwhr, the overall cost per lb treated was 1.965¢ with gas against 1.14¢ with electricity. These figures include maintenance, cyanide, and labor costs, in addition to fuel costs, and indicate a 42% saving in operating cost with the electric salt bath furnace. In this figure is a 25% saving in cyanide which is an important consideration as there is a shortage at the present time.



**HIGH HEAT ZONE of continuous type enameling furnace is used to enamel washing machines, dishwashers, sinks, and other products. The 1200-kw electric furnace has a lower operating cost than a similar gas furnace and it raises power factor to over 95%. Incremental electric cost of this additional load was $2,519 per month**

**Brazing Applications . . .** Electric furnace brazing which has played such an important role in the manufacture of many assemblies is practically indispensable in many fields and especially to the refrigeration industry. Many machining and welding operations are eliminated and assemblies can be brazed in one operation. One illustration is a roller-hearth furnace used for copper-brazing of evaporators for refrigerators. Two such furnaces, rated at about 320 kw each, have been in operation for many years and in the last few months a third furnace has been installed. In this process an atmosphere gas generator is used to provide a protective atmosphere for the brazing process and to bring the parts out with clean surfaces. This gas expels air from the furnace chamber and prevents air entering at the doors.

Here again is a case where maintenance costs are low compared with what might be expected in a gas-fired furnace. The atmosphere in the furnace also serves to protect the nichrome heating elements from being oxidized and hence their life is prolonged. These furnaces are under heat almost continuously, even over the week-ends.

Labor costs in handling material to be brazed are reduced as it is only necessary to load and unload the trays on the roller conveyor. Electric furnace brazed parts withstand high pressures and temperatures, joints are tight, and an improved product at a decreased cost is produced.

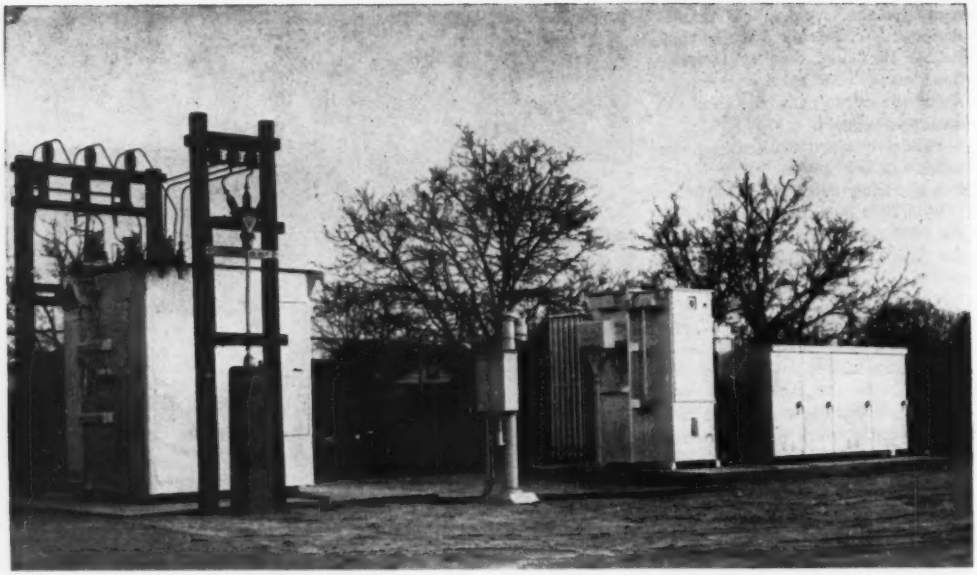
There is an excellent illustration in one case where after careful consideration the customer decided on a belt-type electric furnace with protective atmosphere equipment for annealing copper wire. Specifications called for accurate temperature control, uniform heating and cooling cycles, and controlled atmosphere.

The experiences of this customer to date indicate that clean, uniformly annealed copper wire can be produced at low electrical energy and maintenance costs. The atmosphere gas is one of the most economical gases that can be produced and costs only about 4¢ per 1000 cu ft.

**Electric Galvanizing Furnaces . . .** An example of a careful cost analysis is well illustrated in the case of the electric galvanizing furnace. In this case the seemingly high cost of electric energy is offset in the final analysis by the accurate temperature control, elimination of products of combustion, continuity of operation, lower kettle replacement costs, and savings due to lower dross losses. Despite the higher cost for electricity as compared with fuels the studies made on five electrically heated galvanizing installations indicate that the heating cost averages only 6.6% of the total galvanizing expense. Spelter, labor maintenance, and overhead were the real cost items.

In concluding with furnace operations in the high temperature range for melting iron, steel, and alloys we find quite different kinds of comparisons.

Modern open hearths ranging up to 275-tons capacity average about 5,000,000 Btu of fuel per ton of steel starting with a cold charge. At 150,000 Btu per gal of oil and at 7¢ per gal open hearths could produce steel at $2.33 per ton. On the other hand electric arc melting furnaces of 100 and 125-ton capacity (20,000 to 25,000 kva) require 475 to 500 kwhr per ton of melt. The difference in cost of electricity over fuel oil has to be made up of several items such as a higher percentage of cheaper scrap metal charge than can be used in the open hearth, faster melting, and lower investment and interest charges for the complete melt shop. The electric melt shop can be built for about 60% of the cost of an open hearth shop and with 8 mill electric energy and low scrap cost it is possible for the electric furnace to compete with the open hearth, even in the production of ordinary carbon steel. A group of electric power companies have joined in sponsoring a study on this topic.



**COSTS OF $25 PER KVA for 11/4-kv stations like this 3,000-kva installation, and general refinement of 4-kv design and construction practices will allow Southern California Edison to serve new loads economically in present 4-kv service areas**

# Refine 4-kv Design and Construction in Old Load Areas, Use 11-kv in New

**System-wide study indicates that cutover to 11 kv is justified only in case of modernization or rebuild; but that intermediate 11/4-kv transformation cost is greater than the extra cost for direct 11-kv distribution in many new load areas**

**GEORGE A. DAVIS, Engineer, System Planning Division**
**Southern California Edison Co, Los Angeles**

Use of larger components in the expansion of 4-kv distribution, coupled with more emphasis on direct service to customers at 11 and 16 kv, is the basic recommendation resulting from a system-wide study of the distribution practices of Southern California Edison Co.

As a supplement to the study of the entire system, a detailed plan for distribution load growth was presented on a district area basis for use as a guide for fitting yearly distribution additions into an integrated over-all program.

Specific conclusions and recommendations of the study were these:

**1.** In general, loads on the Edison 4-kv distribution system have not approached the limits of 4-kv distribution capability. With increased use of larger components, distribution at 4-kv can be expanded to supply load growth in existing 4-kv areas.

**2.** High and increasing costs of 4-kv substations justify supplying more new loads at 11 and 16 kv. In service areas having 11 kv as a subtransmission voltage, new load areas generally should be served at 11 kv. Rural 4-kv circuit ends should be cutover to 11 kv, and heavier urban loads should continue to be served at 11 kv. In service areas having 16 kv as a subtransmission voltage, 4-kv delivery should more generally be retained.

**3.** Cutover of established areas from 4 to 11 kv cannot normally be justified unless some of the costs can be allocated to modernization or rebuild.

**4.** Pole line construction at 4 and 11 kv should employ as many interchangeable items as possible. Pole configuration for 4-kv construction in applicable areas should be designed for eventual conversion to 11 kv at minimum cost.

**Costs of 4 kv vs 11 kv . . .** The study indicates that the high and increasing costs of 11/4-kv substations is absorbing the cost differential between distribution at 4 kv and distribution at 11 kv. To illustrate this point Fig 1 shows average cost per kva of 11/4-kv and 16/4-kv post-war Edison substations. Weighted system average cost is $32 per kva. Due to diversity, each kva of 4-kv distribution transformer capacity is served by 0.84 kva of 4-kv station capacity on a system basis. When adjusted for this diversity, $26 of 4-kv substation investment can be eliminated for each kva of distribution transformer capacity served at 11 kv instead of 4 kv, as a system average.

Customers can be served more economically at 11 kv if the additional cost per kva of 11-kv distribution above the cost of 4 kv does not exceed the average break-even figure of $26 per kva. This break-even figure varies for different service areas depending upon local cost per kva of the eliminated 4-kv station. It also varies with the ratio between distribution transformer capacity and substation transformer capacity for the service area concerned.

Additional cost for 11-kv distribution compared to 4-kv distribution, after adjusting for the diversity ratio of 0.84 between distribution transformer and substation transformer capacity, was found to vary between $6 and $18 per kva in the areas investigated (Fig 1). Weighted system average was $11 per kva.

Therefore it is apparent that the break-even figure between 11-kv and 4-kv distribution costs would seldom be exceeded by the additional cost for new 11-kv distribution. This fact is the basis for the recommendation to serve most new load areas at the higher distribution voltage. Savings by distribution at 11 kv will be greater in slowly growing light density areas where the 4-kv station would be small in size and high in cost.

## Adding It All Up, Here's Why . . .

***Others Have Adopted Systemwide High Voltage Distribution***

1. Present or future loads (of the order of 6,000 to 12,000-kwh annual domestic consumption) are beyond the capabilities of 4-kv systems.

2. The higher distribution voltage can be the same as a present subtransmission voltage, generally at the 12-kv level, eliminating one transformation step.

3. Higher voltage can be a standard voltage utilizing repetitive manufacture items and streamlined construction features such as common neutral, single phase construction without crossarms, and single bushing transformers.

4. Cut over to higher distribution voltage can be incorporated with rebuild and modernization of 4-kv areas.

***But Southern California Edison Has Not***

1. Average annual residential consumption is 1,500-kwh, and 4-kv is adequate to carry foreseeable loads in established 4-kv areas.

2. Edison has an 11-kv subtransmission system, but also has an extensive 16-kv (non-standard voltage) subtransmission system, where the intermediate transformation cannot be economically eliminated under present conditions.

3. California rules for overhead construction prohibit common neutral above 5 kv. This and other conditions of joint pole use and coordination with communication lines prevent higher distribution voltages from being as competitive with 4 kv in California as in other states.

4. Most of Edison's 4-kv service areas are comparatively new, and complete area-wide rebuilding or modernization is not presently required of 4-kv areas.

**Cutover of 4 kv to 11 kv Distribution . . .** Cutting over established 4-kv areas to 11 kv did not show the clear cut economic advantage indicated for 11-kv service in new load areas. Costs of cutover varied widely depending upon local conditions such as average size of transformers, number of poles to be replaced, and number of corners to be rebuilt. As plotted on Fig 2, costs of cutover from 4-kv to 11-kv

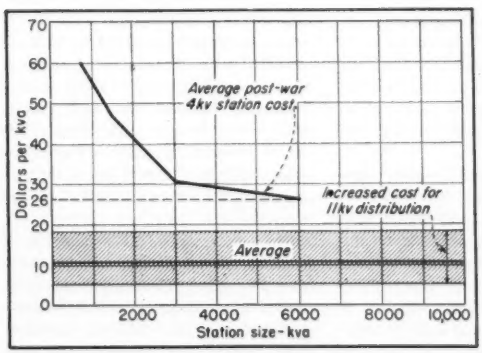



**FIG 1—CONSISTENTLY LESS EXPENSIVE than average cost of 11/4 or 16/4-kv intermediate transformation, 11-kv distribution will be used in serving new areas. Break-even point is about $26 per kva of distribution transformer capacity**

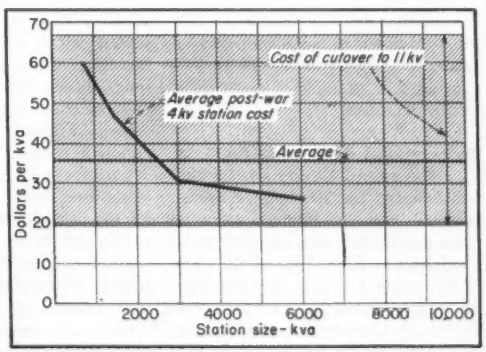



**FIG 2—COST FOR CUTOVER TO 11 KV varies widely, generally is greater than cost of new 11/4-kv station capacity in larger stations now needed. Cutover can generally be justified when incorporated in modernization or rebuilding**

distribution varied between $19 and $66 per kva after adjusting for the diversity ratio between distribution and substation transformer capacity. Weighted system average cutover cost was $36 per kva.

Comparing the average cost of $36 per kva for cutover from 4-kv to 11-kv distribution with the average cost of $26 per kva of 4-kv substation capacity eliminated by 11-kv distribution, it is apparent that unless a portion of the cutover costs can be allocated to modernization and rebuild, cutover to higher voltage in an established 4-kv service area can seldom be justified economically.

Distribution at the "higher" 11-kv and 16-kv distribution voltages is already well established on the Edison system, principally for service to rural and larger urban loads. Direct distribution transformer capacity at 11 kv and 16 kv is 1,540,000 kva, or 49% of the total direct distribution transformer capacity to consumers. Direct distribution at 4 kv is 1,244,000 kva, or 39% of the total, while 7-kv and direct 66-kv delivery accounts for the remaining 12% of the total. Over three-fourths (739,000 kva) of the 4-kv substation capacity is served from 11-kv and 16-kv lines.

During the past five years, the number of meters on the system has increased 47%, kwhr output has increased 40%, and net system kw peak demand has increased 57%. There is little evidence that this rate of increase will be less for the next few years, and the ultimate demand considered in that part of the study concerned with the physical adequacy of 4-kv distribution was double the present demand. It was found that the 4-kv distribution system could be expanded to supply double the present demand with substantial margin for further increases.

**Recommended Refinements for 4 kv . . .** The normal Edison 4-kv circuit was designed for 200 ampere operation with plus and minus 5% three-phase regulators. Average load on 4-kv circuits as determined at the time of the study was 121 amperes, and the load density of the company's 909 sq mi of 4-kv service area at that time averaged about 597 kva per square mile.

Average annual kwhr usage for a residential customer normally served

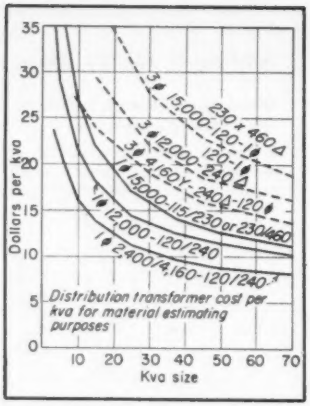

Dollars per kva
Kva size
3 ϕ 15,000-120-1 ϕ
230 x 460 Δ
3 ϕ 12,000-120-1 ϕ
3 ϕ 4,160Y-240-120 ϕ
1 ϕ 15,000-115/230 or 230/460
1 ϕ 12,000-120/240
1 ϕ 2400/4,160-120/240
Distribution transformer cost per kva for material estimating purposes

**FIG 3—PRESENT COST DIFFERENTIAL between 15-kv, 12-kv, and 4-kv three-phase and single-phase distribution transformers is expected to decrease further with standardization and repetitive manufacture as the higher voltage items are more widely used**

by the 4-kv system was approximately 1,500 kwhr. These relatively low values are caused by competition from low cost fuel for cooking and heating which results in a relatively low range and water heater saturation, and a preponderance of single family dwellings in Southern California Edison's service area.

System refinements recommended to supply the increasing loads at 4-kv distribution included increased use of: 300-amp circuits using present 2/0 conductor; 400-amp circuits using 4/0 conductor; 10% regulators; bus regulation in areas of heavier density; and more capacitors on circuits, some of which will be switched on a voltage basis. Other recommendations included setting bus voltages so as to operate regulators well into the buck range during the light load periods, and more economical loading of equipment based on present-day operating experience.

Larger capacity transformers, regulators, etc, were also recommended for use in both 4-kv and higher voltage service areas. Under the recommended program for serving the load growth, average size of 4-kv substations will increase from 3,970 kva to 6,340 kva by 1960, and average regulator size will increase from 140 amp to 233 amp. This increase in capacity of component parts of 4-kv distribution is consistent with increased kwhr consumption and increased demands per consumer, and with greater reliability which can be placed upon modern electrical equipment and operating methods. These and other economical 4-kv and higher distribution voltage practices which have been accepted throughout the U. S. are applicable to the Edison system in Southern California.

**Service at 11 and 16 kv . . .** Many more new loads can be served economically at 11 or 16 kv than was previously thought possible, principally because of the high and increasing cost of 4-kv substations which would be eliminated by serving more new loads at the higher voltage. It is important to remember that where distribution at 4 kv is already established in an area, cutover to 11 kv is difficult to justify economically unless part of the costs can be allocated to modernization or rebuild, or unless the higher voltage is necessary to carry the increasing loads. In new construction, however, extra costs of 11-kv delivery seldom exceed the cost of the intermediate 11/4-kv stepdown substation and equipment.

It was therefore recommended that most new loads in service areas with 11-kv sub-transmission lines should be served at 11 kv. The 4-kv service areas should be restricted to their present boundaries and rural 4-kv circuit ends should be cutover to 11 kv when expenditures become necessary to improve 4-kv service. Heavier loads in 4-kv areas should continue to be served by taps to existing or new 11-kv lines.

With few exceptions, voltage regulation for Edison 11-kv and 16-kv circuits is provided on the 66-kv side of 220/66-kv transformer banks at 12 major substations. When additional correction is required for high voltage distribution, 11-kv regulation can be provided by means of bus regulators, load ratio control transformers, or individual circuit regulators as necessary.

The recommended 11-kv direct distribution circuit would be designed for a 150-amp 3,000-kva demand, and would be constructed with 2/0 conductor mains. This will provide adequate capacity for present loads and for future expansion using branch feeder protection. The recommended 11-kv circuit capacity corresponds

closely with the recommended 400 amp, 3,000 kva maximum capacity for 4-kv circuits.

**Equipment Costs . . .** Cost comparisons between distribution equipment at the various voltages demonstrated that with the exception of oil circuit breakers, major items such as substation regulators and transformers show relatively small increases in cost at the higher voltage but considerable decreases in cost in the larger sizes. Distribution line materials on the other hand are comparatively higher in cost at the higher voltages, the larger increases in cost being for distribution transformers, aerial cable, and oil-filled disconnecting devices. Oil-filled and subway type disconnecting devices are generally not available at 11 kv, but could be used to good advantage for many types of installations.

As greater use of 11-kv distribution continues on a national scale, standardization and repetitive manufacture of 11-kv items is expected to reduce the cost differential between 11 kv and 4 kv. In the meantime, wage and price trends may continue to increase installed cost per kva of both 4-kv substations and of 4-kv and 11-kv distribution in the field. As this trend continues, the percentage difference in cost between 4-kv and 11-kv distribution in the field will decrease. Each kva of 11-kv distribution with its decreasing differential cost over 4-kv distribution will then eliminate a progressively more costly kva of the 11/4-kv substation investment. Illustrating this trend, the cost of either a 15 kva 2.4-kv or 11-kv distribution transformer has increased approximately 20% in two years, but the difference in cost between the 15 kva 11-kv and the 15 kva 2.4-kv distribution transformer has decreased 3% during the same period. (See Fig 3 on the preceeding page.)

To take advantage of this decreasing differential, design of pole configuration at 4 kv and at 11 kv should utilize as many interchangeable items as possible in anticipation of prospective future cutover to the higher voltage. Spacings and materials used for 4-kv line construction in areas which have the better possibility of future cutover should be designed for possible conversion to a higher voltage at minimum cost.

**16 kv Less Competitive . . .** Distribution at "non-standard" 16 kv did not prove competitive with distribution at 4 kv as often as did distribution at 11 kv. In general, 4 kv should be retained in service areas having 16-kv subtransmission lines. However, the study showed that additional heavy urban loads and more rural loads can be served economically at a voltage level of 16 kv with reference to the break-even figures.

Establishing a third and "standard" higher distribution voltage within the 16-kv subtransmission boundaries would add to stores and operating problems, and was found neither necessary nor economical at this time. Considerable national interest has been shown in establishing a standard rural voltage between the present 12-kv level and the 22-kv subtransmission level.

If the upward trend of voltages continues, and the 16 kv is established as an industry standard, 16 kv might then compete with 4 kv.

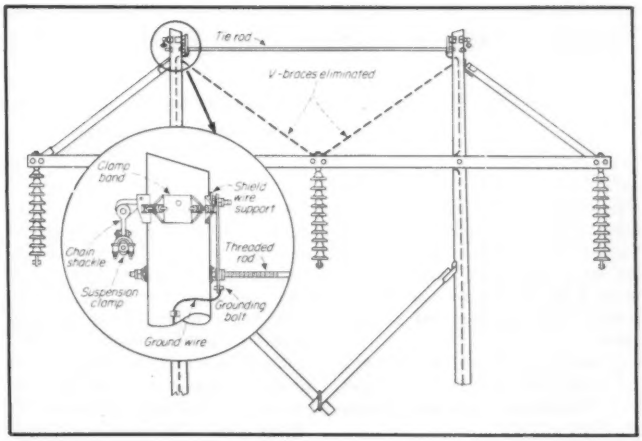
# Tie Rod Design Saves Steel in H-Frame Structure

C. M. LYTLE
Supt. of Engineering, Kansas City Power & Light Co

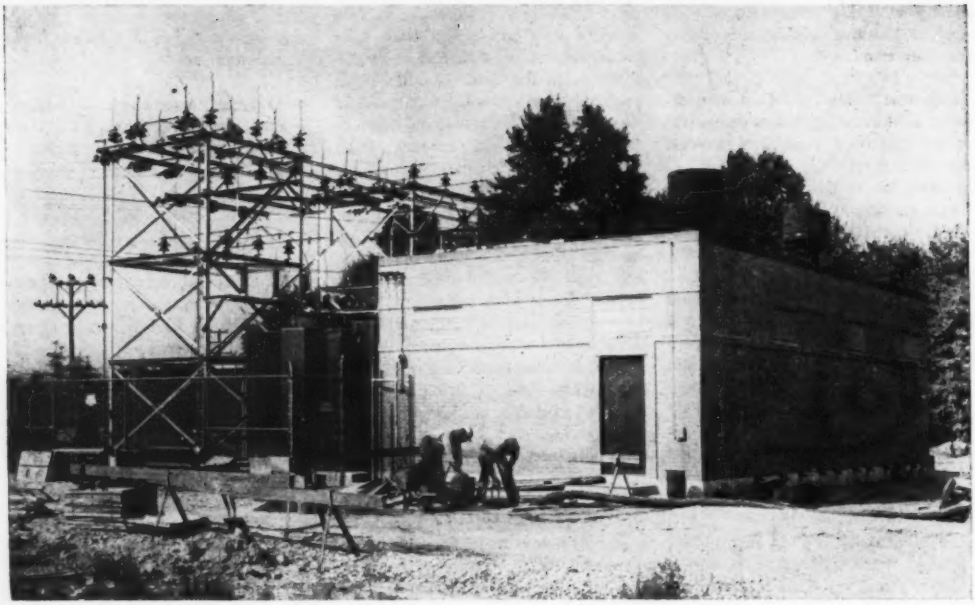
To provide an electrical tie between shield wires at each structure, Kansas City Power & Light Co has designed an H-frame with a tie rod between pole tops. The alternative method is to use an angle iron. Due to scarcity of materials angle irons are more difficult to obtain than tie rods. They also require a greater amount of steel.

Besides reducing the amount of steel required, tie-rod design provides sufficient bracing at top of structure to eliminate the need for V-braces from the pole tops to center of the crossarm.

Clamp bands around the pole top prevent pole splitting in the event of lightning strokes. Strap connection between tie rod, shield wire and ground wire eliminates possibility of connection breaking due to movement of the shield wire.




**TIE ROD between poles instead of angle iron eliminates need for V-braces. Clamp bands (circle) prevent pole splitting if struck by lightning. Strap between tie rod, shield wire support and ground wire insures connection in spite of shield wire movement**



**HALL SUBSTATION** is one of CEI's newest substations designed for added economy and efficiency of operation

# C.E.I. Engineers Stress Economy In Redesign Of Standard Substation

**In addition to direct savings in equipment, elimination of frills in semi-automatic substation brings economies in building structure. Volume cut from 2,500 to 1,500 cu ft per feeder**

C. E. WINEGARTNER, Supervising Engineer and R. A. HUNT, Senior Engineer
Substation Section, Electrical Engineering Dept
Cleveland Electric Illuminating Co

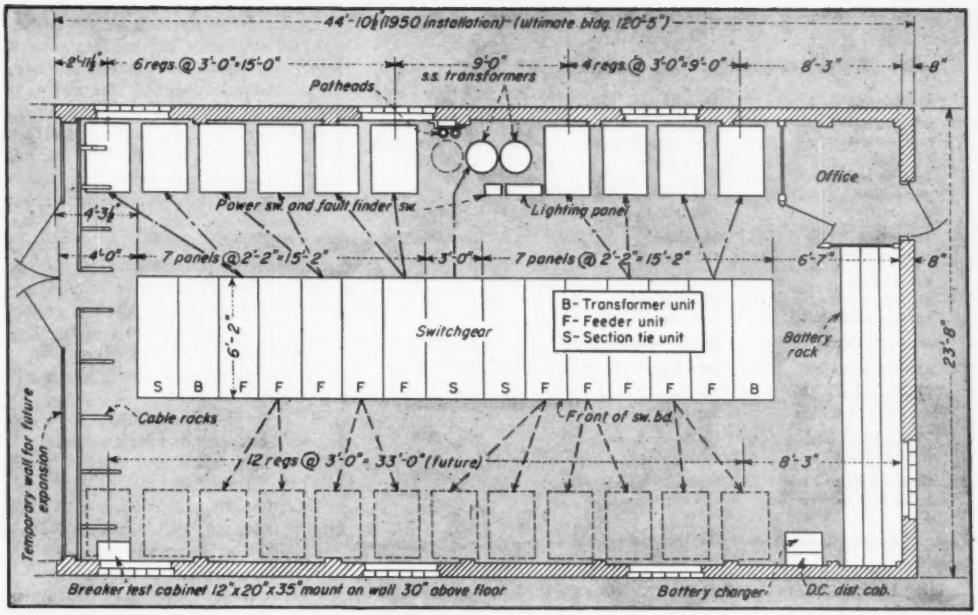
The problem that engineers of this company set for themselves recently was this: To redesign a standard semi-automatic step-down substation to make it competitive in cost with an outdoor unit substation and still provide:

1. Shelter and comfort for travelling operators, trouble crews, maintenance and test personnel.
2. A low cost masonry building design more acceptable to the public than an outdoor substation.

**Electrical Design Savings . . .** Our primary objective was to obtain the maximum economy in electrical design. Use of 5000/6250 kva 3-phase load ratio control transformers, provided for a regulated bus, compensated for load. Distribution engineers laid out feeders in three groups. The shortest feeders rely on the regulated bus without individual regulators for voltage control. Medium length feeders are provided with 2 single-phase regulators in open delta. Long rural feeders have three regulators in delta.

Six such substations are being built. Each has a two-section bus, with one transformer and five feeder positions per section. The initial installation in one of these will have five feeders with two regulators each. This is a net saving of five single phase regulators. As the load develops, five more feeders will be added, the shorter ones without regulators.

In normal operation the transformers are paralleled on the substation 4,800-v bus. Their primaries are connected to separate transmission lines,




**REDUCED NUMBER OF REGULATORS** installed in rows in front of and behind switchgear helped cut volume of building

which may be at different voltages. To maintain balanced loading of the transformers a circulating current method of control is used. This permits the transformers to operate out-of-step. This method employs reversed compensation through cross connected paralleling reactance transformers.

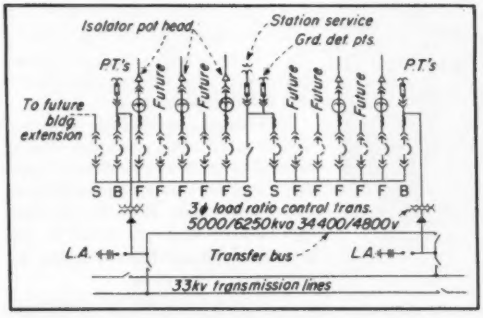
Prefabricated metalclad switchgear was used in place of custom-built switchboards.

The transformer breakers have reverse power relays, and automatic reclosing with time delay after their potential transformers are re-energized. The overhead supply circuits also have instantaneous reclosing equipment at the transmission substation, so that most outages in the supply should be limited to a few seconds. Feeder circuits have conventional over current induction relays with instantaneous attachments, timers for three automatic reclosures, and excess current lock-out relays. Metering is primarily by thermal demand ammeters having both instantaneous and maximum demand indicators.

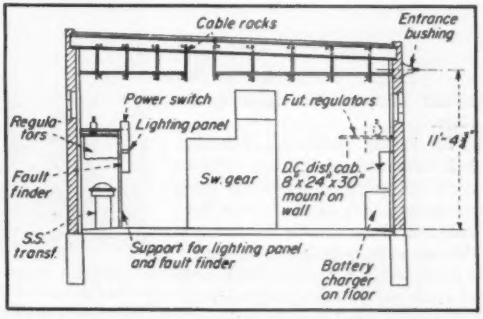
The battery charger is a selenium rectifier with automatic voltage regulation through magnetic amplifier control. This should provide maintenance-free operation for many years.

The transformer leads and the regulator leads are brought into the switchgear from above. The leads are supported on open cable racks suspended from the ceiling.

Control, lighting, and power conduit are exposed and suspended from the ceiling. Lighting consists of twenty-four 200-watt incandescent fixtures. Outgoing feeder cables leave by way of a duct line under the floor.




**BASIC CIRCUIT** used in six new standard substations is shown. Primaries are connected to separate transmission lines




**OPEN CABLE RACKS** suspended from ceiling support leads that drop down into transformer and regulator positions

## These Design Changes Brought These Approximate Cost Savings

| Old Design | New Design | Saving |
|---|---|---|
| Single-phase fixed ratio transformers and 3-phase regulators per feeder | Regulated bus with LRC transformers and 2-phase regulators on some feeders. No regulators on others | Cuts regulator cost about 50% |
| Custom-built switchboards | Metal-clad switchgear | Cuts cost 52% |
| Fluorescent lighting and concealed conduit | Incandescent lighting and exposed conduit | 37% |
| Separate battery room | Battery compartment | 88% |
| Cable tunnels | Duct lines under floor | 74% |
| Steel regulator cells 8 to 11 ft high | 16" Regulator oil barriers | 79% |
| Transformer leads in steel ducts | Leads on open cable racks | 70% |
| Glazed wall and face brick wall construction | Common brick inside and outside walls | 60% |

**Building Design Savings . . .** Our secondary objective was to obtain maximum economy in building design. Reducing the number of regulators required, and installing the regulators in a continuous row backed up to the outside walls, both in front of and behind the metal-clad switchgear gave us our maximum space economy.

There is a four-inch gutter at the wall behind each row of regulators and scuppers are provided in the wall to permit oil from a damage regulator to flow outside the building.

To contain oil flow from damaged regulators we provided sheet steel barriers 15 inches high around the base of the regulators.

For the comfort of operating and maintenance men a six foot square office is provided with toilet facilities. This room now is provided with a 7½-kw electric unit heater which is thermostatically controlled. This heater also provides the heat for the battery compartment adjoining the office.

The battery enclosure is 5 ft high, 3 ft wide and 16 ft long. Transite doors are provided for access along the entire length of the battery compartment. Four transite hatches provide access from the top. The battery is supported on a three-step rack made of common brick masonry with one inch transite treads on which the cells are placed.

Heat for the battery compartment is supplied by means of a thermostatically controlled fan which circulates warm air from the office room through the battery compartment and exhausts the air through a vent at the opposite end of the compartment. This permits keeping the battery near the most satisfactory operating temperature, without cost of a battery room.

**READING A KILOWATT-HOUR METER at Hall substation is Henry Gans, supervisor of northeastern district substations for CEI. Note metal-clad switchgear panels, and battery compartment**

The heating system for the switchgear section of the building consists of two 10-kw unit heaters, also with thermostatic control. This system is designed to maintain a moderate temperature when the substation is not attended. This eliminated the electrolysis problem associated with underground gas lines in previous heating installations.

The ventilating system consists of two 24-inch standard gravity type roof ventilators with chain operated dampers, ¾ hp, 3-phase, 220-volt motors and 23-in. fans. These fans are thermostatically controlled. Three 5-sq ft louvered openings provide adequately for intake air.

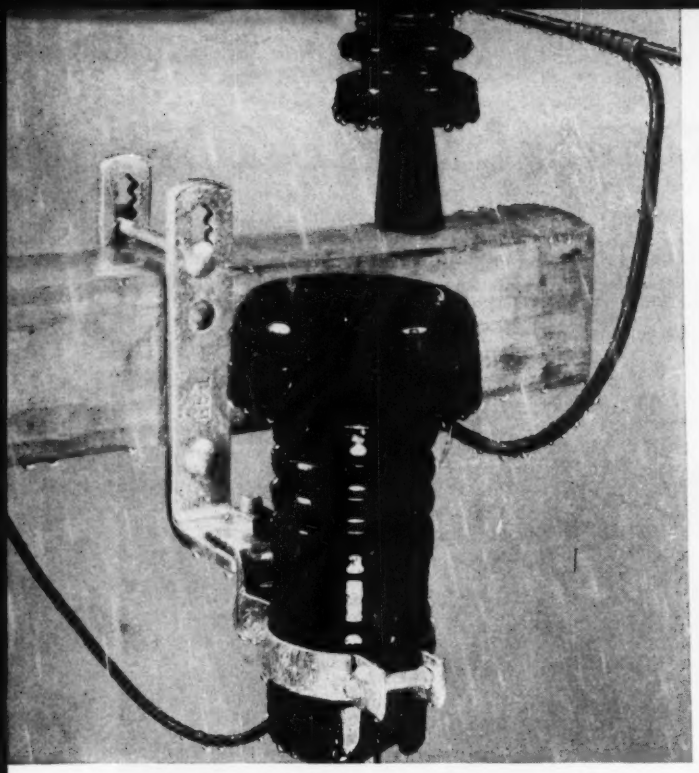
The substation building is of one story construction with common brick for both inside and outside walls. This permitted the use of wall bearing roof supports in place of a steel frame building. Glass block windows are used to improve architectural appearance.

The feeder cables leave the substation thru a concrete encased bank of 21 4-in. fibre ducts. This number takes care of the initial installation and the first extension to the building. These ducts run from each feeder position, under the substation floor and out to a manhole in front of the substation. The ducts for the final addition to the building will be installed at the time that addition is made.

The initial installation of this type of substation consists of a building 23 ft 8 in. wide by 44 ft 10½ in. long, with a temporary wall at one end made of Galbestos siding. Two future extensions can be added; the first 41 ft 6 in. long, and the second, 34 ft long. Each section of the building will provide for two transformer units, a bus sectionalizing unit, and 10 feeder units, with a bus tie unit between the original and the second installation, and between the second and the final installation.

This design, in addition to direct savings in electrical equipment, labor, and individual items of building equipment, has also resulted in a reduction in building volume from the older design of 2500 cu ft per feeder to the present, more economical design of 1500 cu ft per feeder.

By standardizing on this design for six substations, engineering costs have been lowered.



**General Electric Pellet Arresters** give the same excellent protection to transformer windings in wet weather or dry, in low humidity or high, when new or after years of service. And their low sparkover voltage and low IR drop assure a degree of this protection unexcelled by any other distribution arrester.

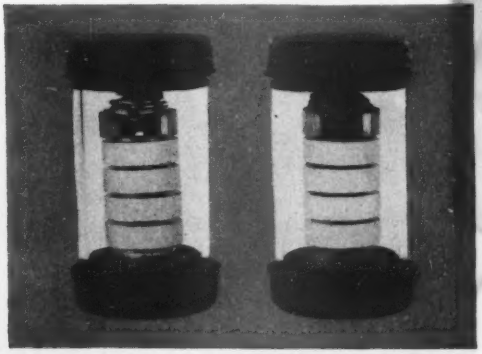
# MOISTURE doesn't hurt this arrester

The General Electric Pellet Arrester has a unique valve element that is unaffected by service moisture—and gap electrodes that are sealed in dry nitrogen ($N_2$)—exclusive features that mean more enduring protection against lightning.

In addition, pellet arresters use inorganic insulation throughout—no internal fiber to "track", carbonize or wear away. Whether valve- or expulsion-type, no other distribution arrester is so unaffected by service moisture.

*Write for Bulletin GEA-2975. Apparatus Department, General Electric Company, Schenectady 5, New York.*

**Valve Element Unaffected by Service Moisture!** Efficient valve element is a column of lead peroxide pellets—pellets which are actually formed with water in a tumbling barrel (above). Moisture in service causes no change whatever in the unexcelled protective characteristics of this pellet valve column.



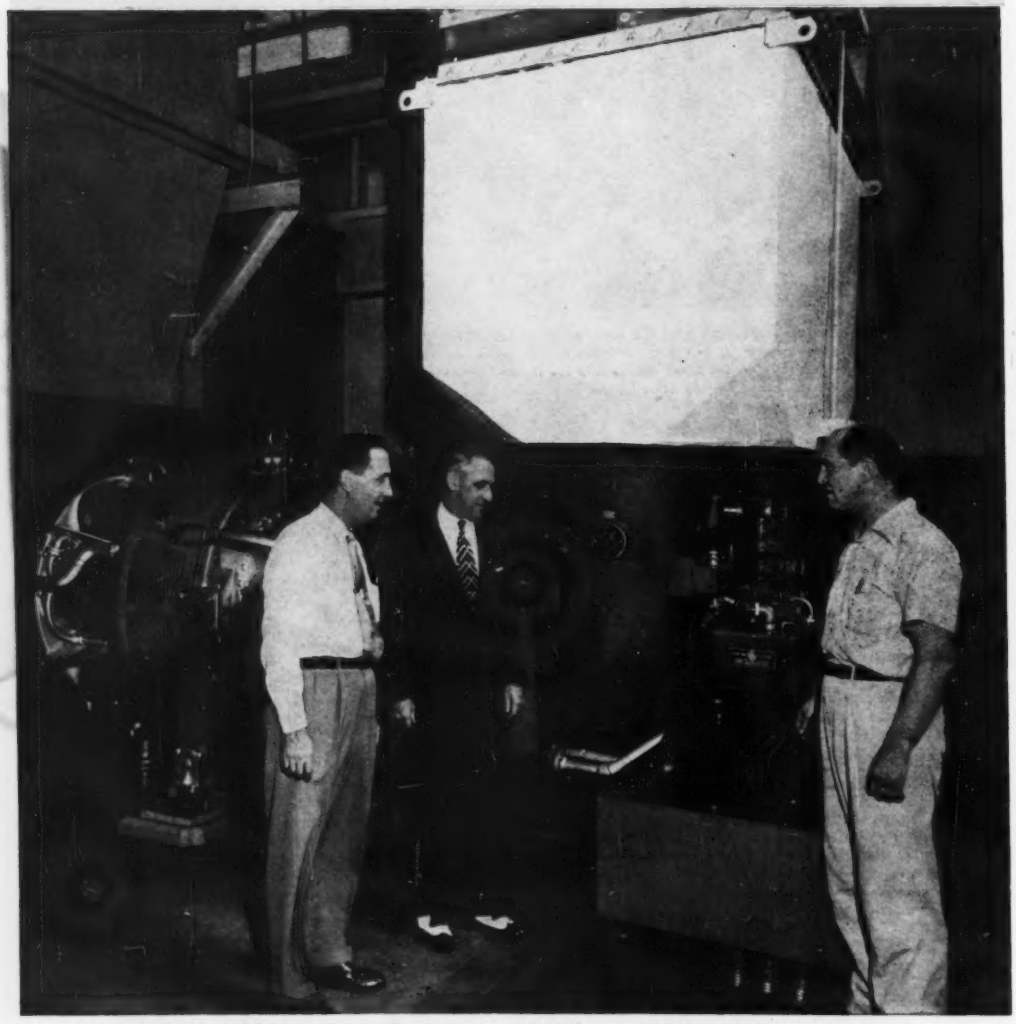
**$N_2$-filled Gap Excludes Corrosive Moisture!** Here's life-test proof: electrodes at left were sealed in dry nitrogen—those at right sealed in air, and both exposed outdoors under maximum rated voltage. Result: $N_2$-protected gaps are bright and clean; gaps sealed in air are discolored and corroded.

GENERAL ELECTRIC

# Combustion-Gas-Turbine

| | |
|---|---|
| Total Installed Hours | 17,604 |
| Hours in Service | 15,241 |
| Total Power Produced in KWH | 66,465,000 |
| Average Load | 4361 KW |
| Hours Scheduled Out | 2326 |
| Hours Forced Out | 37 |
| Unit Capacity Factor | 124.6% |

*A duplicate unit has just been ordered for installation in this station.



Donald S. Kennedy, President of Oklahoma Gas and Electric, inspects the 3500-kw combustion-gas-turbine at the Belle Isle Station with C. C. Willis (extreme left) Superintendent of Generation at O.G. & E. and G. D. Conley (extreme right), Chief Engineer at Belle Isle Station.

# *completes 2 years at Belle Isle**

**"Surpassed Expectations" says Donald S. Kennedy, President of Oklahoma Gas and Electric.**

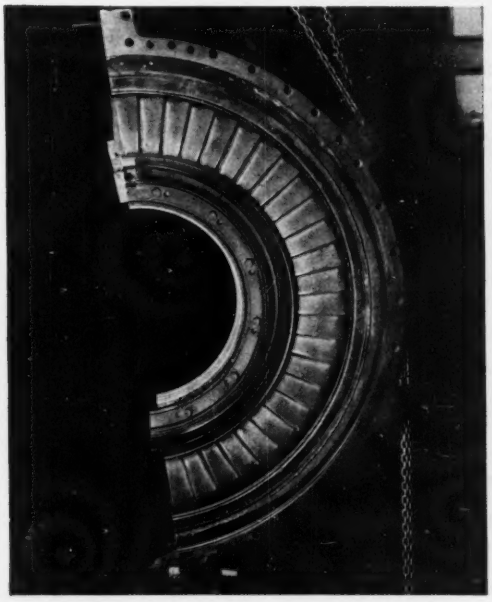
The first combustion-gas-turbine to be placed in commercial service in America has completed its second year of successful operation at the Belle Isle Station of the Oklahoma Gas and Electric Company. On the line since July 29, 1949, the 3500 kw unit has established a record which has surpassed contract commitments for both capacity and economy.

Donald S. Kennedy, President of the Oklahoma Gas and Electric Company, hailed the unit as eminently successful. "The combustion-gas-turbine at Belle Isle has been easily operated and maintained by our regular plant personnel. Maintenance costs have been lower and kilowatt output higher than we had anticipated. The output has averaged well over 100 per cent. Availability has been consistently high with only thirty-seven hours forced outage, due largely to the failure of a lube oil pump impeller. For availability, economy, and capacity, our gas-turbine has surpassed expectations."

General Electric combustion-gas-turbines are available in both 3500 kw and 5000 kw ratings. For complete details call your nearest G-E sales office or write for Bulletin GEA-5516, "Gas Turbine Power Plants." General Electric Company, Schenectady 5, New York.

## 11,823-HOUR INSPECTION REVEALS EXCELLENT OPERATING CONDITION

A routine semi-annual inspection of the Belle Isle gas turbine was held in March, 1951. This careful check-up on all original parts failed to uncover any major components —either rotating or combustion—which required replacement.



This half-section of the second-stage nozzle diaphragm had undergone almost no deterioration in twenty months of service. Its condition, typical of all diaphragm pieces, warranted no maintenance.

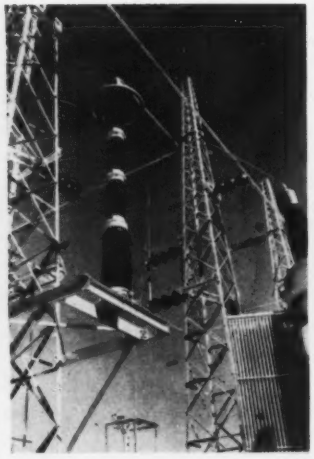
All six combustion chamber caps were reinstalled for further service. The discoloration around the gas fuel nozzle of this cap is a deposit of noncombustible residue from the fuel.

The compressor rotor, shown here with the top half of the casing removed, had collected a slight amount of dirt but was otherwise in original condition.

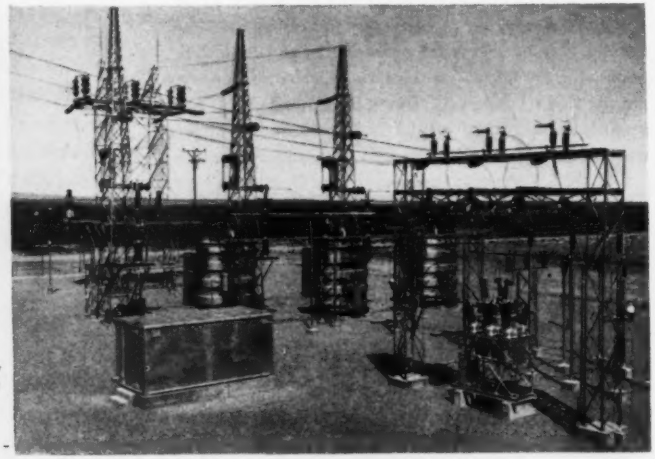
GENERAL ELECTRIC

255-5

# HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



**LIGHTNING ARRESTER** mounted on bracket on dead-end tower is feature of inexpensive method of construction used at the Diffin substation



**ECONOMICAL SUBSTATION** of Idaho Power Co provides low-cost power for deep-well pumps which furnish water to reclaimed desert. Control building in foreground was built from prefabricated aluminum van body. Station is operated by remote control over 138-kv transmission lines from power station 70 miles away

## Simplicity Results in Substation Economy

Simplicity in layout, elimination of such items as tracks or trucks for transformers, and use of steel structures combine to give Idaho Power Co a low unit cost of $12.87 per kw for a 13,333 kva, 138-33-kv substation near Rupert, Idaho. This low cost was achieved without sacrifice or low maintenance, and includes provision for remote control operation. The station will supply power for deep well pumps in the reclaimed desert land of the area, serving 33-kv distribution lines from the company's 138-kv transmission system.

Low cost per kw was necessary to provide a satisfactory pumping rate for this irrigation. At the same time, operation of the station has to be completely reliable because of the large investment in crops dependent upon water delivered by electrically-driven pumps.

Both wood and steel structures were considered in the preliminary design. Comparisons showed that steel presented the most advantages in providing maximum simplicity of layout, greater future expansion space, and lower maintenance costs. An equivalent wood structure, built with strain buses, would require at least four times as many insulators with corresponding reduction in reliability. Provision for expansion from 13,333-kva to 26,666-kva capacity by replacement of the transformer bank was provided for in the plans. Forced air cooling equipment has been installed on the transformers to increase their overload capacity rating.

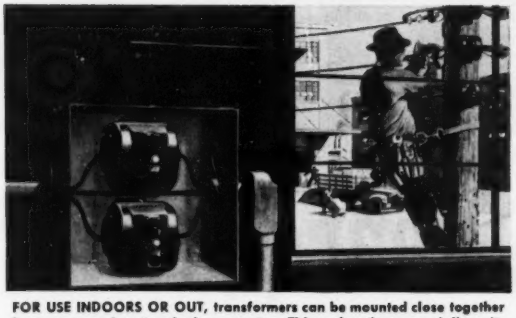
### Remote Control Operation

Because the station is 45 miles from the nearest operating personnel and because cost of shift operators is prohibitive, remote control operation was chosen. A complete supervisory system was installed with carrier current telephone and standard 120-v dc station battery. Switching and general supervision is accomplished by supervisory control operating over the 138-kv transmission lines from an attended power plant approximately 70 miles away.

Ample room is allowed around equipment for examination and servicing. Operating platforms provide for the replacement of high voltage fuses, and lightning arresters are bracket-mounted on the dead-end towers. Direct burial control cable is used. The control house, instead of the usual masonry structure, is a prefabricated standard aluminum van body. It was lined with hard masonite in the company's assembly shop. The only field work in construction of the house was the pouring of concrete to provide a foundation.

Final construction cost of the station was $171,601. Yearly maintenance costs are estimated to be almost negligible.

# New G-E indoor-outdoor current transformer helps reduce stock requirements—cut inventory costs



**FOR USE INDOORS OR OUT, transformers can be mounted close together because secondary terminals are on top. This makes them especially suitable for use in small boxes. They can also be mounted directly on poles.**

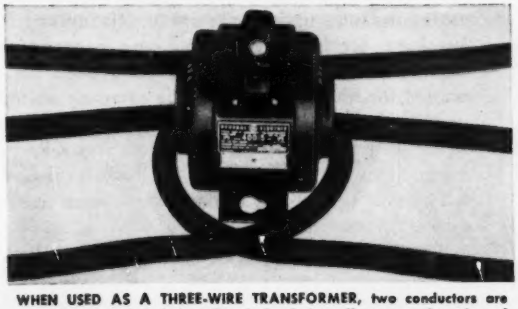
**ONE BUTYL-MOLDED UNIT FOR FIVE APPLICATIONS.** For the first time, you can buy a single current transformer that can be used for five different applications. General Electric's new *butyl-molded* Type JKP-0 transformer can be used on ordinary applications either indoors or out. It can also be used as a three-wire transformer . . . indoors or out. In addition, it is interchangeable with wound-type transformers to meet EEI specifications.

Result: reduced stock requirements and inventory costs.

New 600-volt Type JKP-0 transformer has primary ratings of 200-, 400-, and 600-amperes. For complete information, contact your local G-E representative or write Section 604-30 for Bulletin GED-1465. General Electric, Schenectady 5, N. Y.

**GENERAL ELECTRIC**

604-30



**WHEN USED AS A THREE-WIRE TRANSFORMER, two conductors are passed through the window. Two-inch window allows easy insertion of full-sized primary cables for either indoor or outdoor installations.**

**WHEN MOUNTED ON ADAPTER PLATE, transformer meets the dimensional requirements of EEI specification M52 . . . thus increasing its interchangeability and making possible another application of the single unit.**

Original 1500-kva single-ended G-E load-center substation installed on plant roof to conserve valuable floor space.

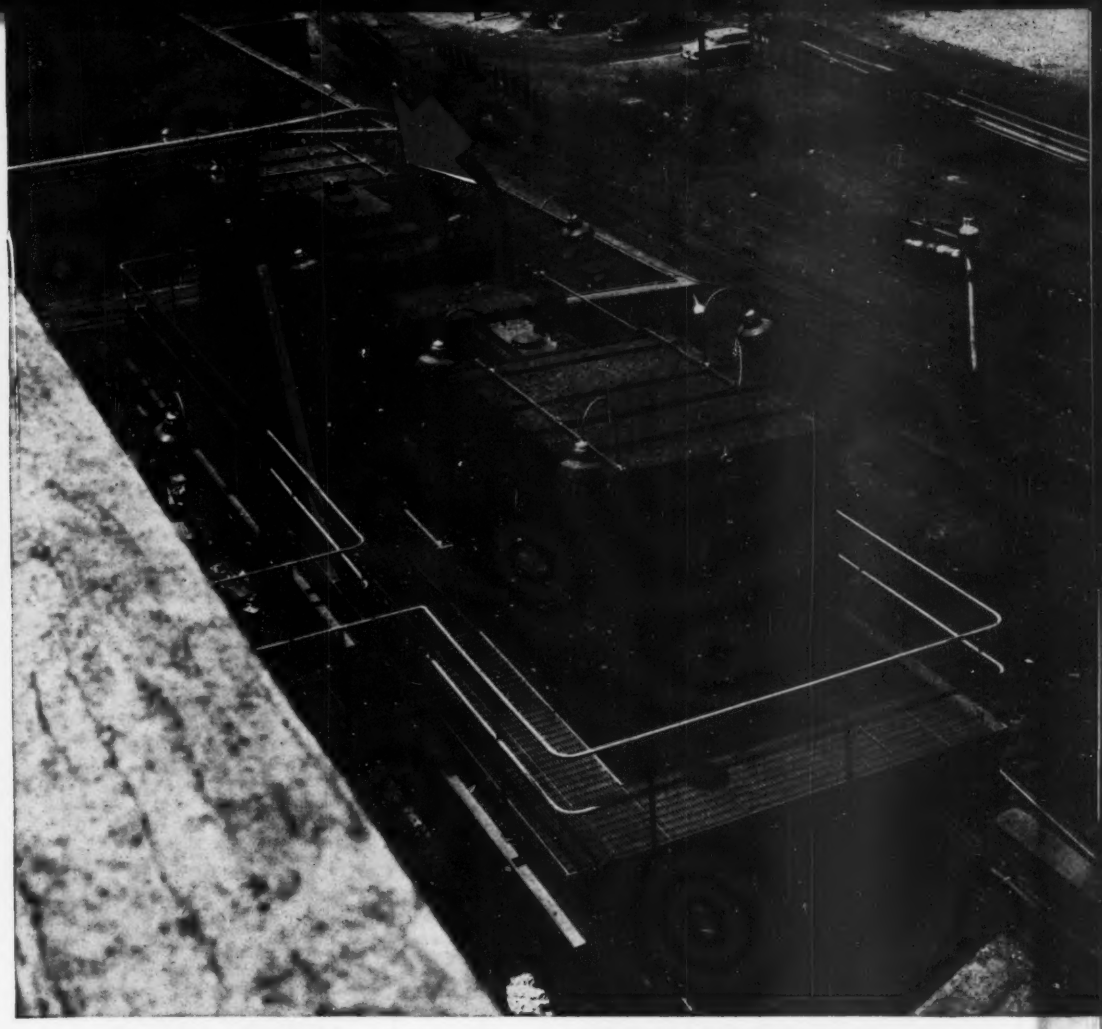
# Foresight that paid off

## POWER DISTRIBUTION SYSTEMS

Some time ago, an Eastern industrial put in a G-E load-center distribution system, knowing that the load served by one of its substations (above left) would probably double within five years. It actually doubled after *one* year.

With any other type distribution, the company would have eventually needed a bigger transformer, taxing the interrupting capacity of existing circuit breakers. Or had the original unit been twice needed size, investment would have been half-wasted for one year. Instead, the company waited until load doubled, then added another "building block" of power of the same economical size, keeping cost-per-kva at optimum. This load area is now fed by two 13,200-volt feeders, one to each transformer, for greater reliability.

What's more, the new substation was installed,



Recent addition of second 1500-kva substation, installed beside original one. Load area is now reached by two high-voltage feeders.

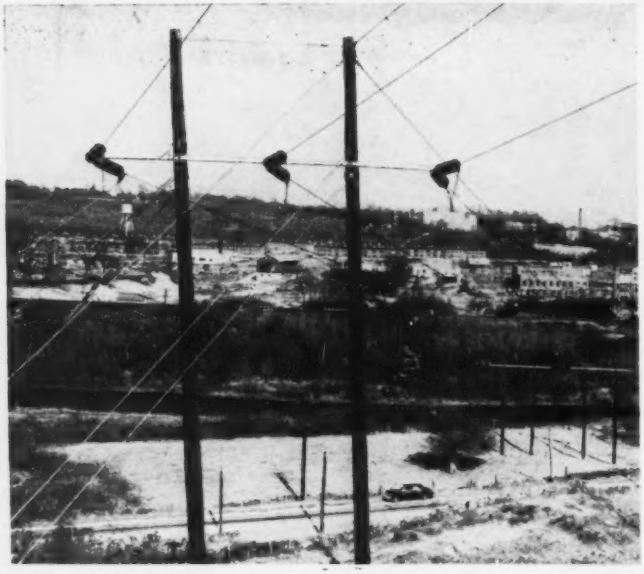
# when power needs doubled

connected and energized without disrupting existing service. *Nothing already done was undone.* Your nearest G-E sales office can help you find the best way to distribute power in *your* plant during these years of expansion. *General Electric Company, Schenectady 5, N. Y.*

834-40

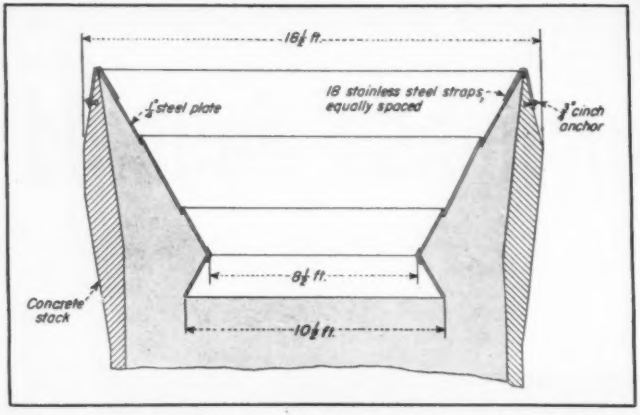
GENERAL ELECTRIC

## Angle Takeoff for 1,100-ft Crossing



**TWO 50-FT WOOD POLES** and two 3x4-in. steel angle sections were used by Connecticut Light & Power Co to span a highway, river and railroad with a second 69-kv supply to its Willimantic substation. The line had to turn about 60 deg in leaving a hilltop and it was desired to provide structural strength at the H-frame where the line turned. Steel angles are bolted to the poles on opposite sides. Phase wires of ½-in. signal bronze conductor have 12-ft spacing and are 34 ft above ground. Overhead ground wires are located 8 ft above line conductors. As indicated in the illustration, the poles are all well guyed for maximum strength

## Use Nozzles to Increase Stack Velocity




**INTERNAL STEEL NOZZLES** for electric generating station smoke stacks will save $30,000, 31 outage days for each 80,000-kw unit and a considerable amount of manpower for Wisconsin Electric Power Co. Nozzles will be installed to increase to three times the discharge velocity on three stacks of the Port Washington plant, in place of rebuilding 45 ft of each stack. Nozzles will prevent down travel of gases

## Rural Service Truck Has Special Body

**J. CALVIN HILL**

**Manager, Fort Wayne Division**
**Indiana & Michigan Electric Co**
**Fort Wayne, Indiana**

Renovation of our small-town street lighting systems necessitated our providing the servicemen with vehicles which would facilitate maintenance of the new systems and which also could handle rural service work.

Through cooperation with a truck body manufacturer and a metal fabricator, we now have six ¾-ton units and two units mounted on ½-ton chassis. These trucks serve all our rural requirements very effectively. The smaller units are adequate in their service areas where requirements are a little less heavy than in the areas provided with the heavier units.

This particular body could be used

**SERVICE TRUCK** has extension ladder which is held in place automatically

on any chassis rated from ½ to 1 ton. All compartments accessible from the sides are similar to those in line-truck bodies but smaller. A sliding metal top covers an enclosed storage space.

The ladder has a 14-ft extension which slides in a framework only slightly heavier than usual. Two slots in the rear step hold the ladder in a vertical position. At 15 ft above ground level the ladder frame is braced by the two inclined legs which lock automatically when erected, thus giving stability for a man working at the top. To lower the ladder the braces have to be raised slightly. When not in use, ladder and braces pivot and lock on uprights.

# Watthour Meters Save Critical Copper

The house type watthour meter has long been recognized as the most accurate measuring device in common use. Today, the shortages of critical materials such as copper and steel, which now confront all industry, emphasize other important values of this device.

The watthour meter conserves kilowatt-hours by reducing wasteful use of electricity. It therefore helps to control kilowatt demand, which is directly related to the capacity of distribution, transmission and generation equipment. Hence, the watthour meter helps to conserve critical materials, all along the line, particularly copper. Following are the results of two interesting studies:

## Quick facts on meter savings

Many studies have been made to determine the difference in the use of power between metered and unmetered loads. Take a typical study. Data were obtained on two housing projects, which had 623 families, to whom power was supplied in bulk; that is, at a flat rate, unmetered. Data were also obtained on two similar projects, with a total of 213 families, whose power was individually metered. Major finding: Unmetered service increased the demand on the system by the minimum of 0.1 kw per customer.

## One kilowatt equals 150 pounds of copper

*Another study was made recently to determine the copper required to increase capacity for supplying residential loads. The copper included that required for power generation, transmission, and distribution—most of it being for overhead lines. Most important fact: about 150 pounds of copper are required to increase capacity by 1.0 kw.

## Meters save many times their weight in copper

The findings of these studies may be summed up this way: Unmetered residential service increases the demand on the system—in one typical case by at least 0.1 kw per customer. That additional demand can be related to system copper all the way back to the generator—and could amount to as much as 15 pounds (0.1 x 150).

Allowing for varying system loadings and design characteristics, it is quite evident that on a broad basis, watthour meters save many times the amount of copper they require; not to mention the savings in magnetic steel, iron, and even fuel, required by the equipment "back of the meter." General Electric, Schenectady 5, N. Y.

**Copper Requirements for Power Systems,* ELECTRICAL WORLD, September 10, 1951. By H. E. Campbell and W. L. Kelly.

GENERAL ELECTRIC

601-80

# Annunciator Shows Availability of Mobile Radio Units

**ANNUNCIATOR carries name of driver and number of each mobile radio unit. Dispatcher checks each unit "in" or "out" of service with bank of toggle switches**


S. W. WINJE
Manager of Electrical Operations

F. E. REASONER
Chief Division Dispatcher
Indiana & Michigan Electric Co
Fort Wayne, Ind.


Mobile-radio "in-service" annunciator at the Fort Wayne Division operating headquarters enables dispatchers and supervisors to determine at a glance which units are in service. In addition, it facilitates minute-to-minute supervision of about 30 vehicles equipped with radio-telephones and eliminates further crowding of radio-transmission channels when traffic is heaviest. The annunciator eliminates unnecessary calling of unattended mobile units, and unnecessary drain of vehicle batteries or running of motors when mobile units are not in motion.

Annunciator is located so it can be seen by anyone in the dispatchers' office. It is controlled by banks of toggle switches between each pair of dispatchers. Any dispatcher can "chalk up" any mobile-radio unit when its operator reports "in service" or "out of service."

The annunciator shows the identification number of each mobile unit, and its driver-operator or foreman. Space at the left of the signal lamp may be used to indicate the type of vehicle and service in which it is engaged. Labels can be easily changed when necessary.

Consideration is being given to adding signal lights and spaces to accomodate similar information on mobile units in adjoining divisions or districts. Some of those units may temporarily come under jurisdiction of the Fort Wayne dispatchers during major emergencies.

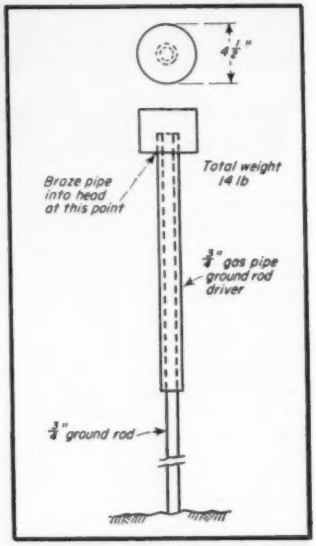
Each mobile unit is required to report "out of service" if the crew leaves a vehicle. On returning to the vehicle they report "in-service." The same holds true when men leave their vehicles at Spy Run yard to enter the operating headquarters or maintenance shop.

A record is not kept of the location of radio-equipped vehicles by map markers or any similar means. Such information is obtained from the dispatcher's log entries, copies of orders issued, or mental recollection of reports. If an "in-service" mobile-unit location is not known, it can be ascertained in a few seconds by radio.

## Ground Rod Driver Reduces Manual Labor


U. R. TROMBLEY
Haverhill Electric Co
Haverhill, Mass.


Easier driving of ground rods has followed the use of a driver made of a 28-in. length of ¾-in. gas pipe, to which is brazed a circular head 4½ in. in diameter. In starting the ground rod the driver is slipped on the ground rod as shown. Ground rod is driven into the ground by working the driver up and down.




**GROUND ROD DRIVER consists of gas pipe brazed to circular head**

When rod is driven downward so that only a short length remains above ground, the driver is inverted and used as a hammer to complete the work.

It is important that the gas pipe is brazed into the head instead of welded. It has been found that an electric weld will not hold.

# *HANDLING* **BIGGER** *LOADS?*

## here's how Engineered System Control can help

THE more generating and tie line capacity you add to your system, the more complex your dispatching problem becomes—and the more L&N load-frequency control can do for you. Engineered by L&N specialists for the requirements of the individual utility, this equipment combines the related functions of telemetering and automatic control. Major power systems which have used this control for years report these principal results:

**Efficient dispatching.** Biggest part of load dispatching is done automatically, clearing system communications facilities of routine data-reporting and load-assigning traffic.

**Closer maintenance of interchange schedules.** Generation and demand are held in close balance in the system's area . . . a prerequisite for satisfactory interconnected operation.

**Greater utilization** of generator and tie line capacity. L&N control smooths out peaks by spreading load changes where they can be most economically absorbed.

**Better economy** of regulating stations. Under automatic control, more stations share in regulation. Station load fluctuations are narrowed.

Now in operation in systems totalling over 40 million kilowatts, L&N control is described in Technical Publication ND4-56-461(1). For a copy, write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Jrl. Ad ND4-56-461(5)

# How Noise Level Values May Be Added

**Curve has been developed for simple cases of addition and gives information in a form which is useful to the lighting engineer concerned with ballast noise**

WILLARD ALLPHIN, Supervisor, Commercial Engineering Dept
Sylvania Electric Products, Inc, Ipswich, Mass.

## Method of Adding Noise Levels

Measurement and interpretation of noise level is expressed in the term decibel (db). This term is a ratio given in the form of a logarithmic unit and is based upon a standardized reference level. Accompanying curve facilitates addition of the units, neglecting special cases such as those involving different shapes of the sound-waves, etc. Examples are given for use of the curve.

**Example 1.** Consider one ballast giving a level of 30 db and another ballast giving a level of 35 db.

The two noise levels are added as follows: Difference between the two values is 5 db. Referring to the curve find the value 1.2 db which is to be added to the higher value.

Therefore, the resultant noise level is 35 plus 1.2 or 36.2 db.

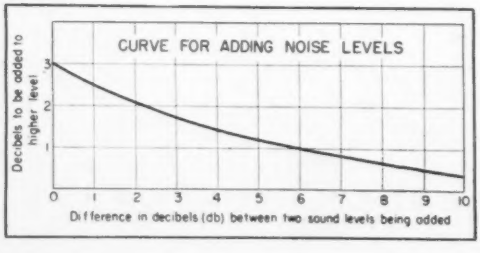
**Example 2.** Consider four ballasts, each giving a noise level of 40 db.

In adding the first two noise levels, the difference between the values is zero. On the curve find the value 3 db which is to be added to the higher value. Thus 40 plus 3 is 43 db.

Next add the third ballast. The difference between 43 and 40 is 3 db and from the curve find 1.75 db. The sum is 43 plus 1.75 or 44.75 db.

Adding the fourth ballast, the difference between 44.75 and 40 is 4.75 db. On the curve find the value 1.25 db which is to be added to the higher value. Therefore, 44.75 plus 1.25 is 46 db, the resultant noise level of the four ballasts.

Latter example is given to show the effect of step-by-step addition. Actually the simplest way to add four equal noise levels is to utilize the fact that any addition of two equal levels results in a net increase of 3 db. Thus two 40 db levels would add to 43 db and two 43 db levels would add to 46 db, the result obtained above.


CURVE FOR ADDING NOISE LEVELS
Decibels to be added to higher level
0
1
2
3
0 1 2 3 4 5 6 7 8 9 10
Difference in decibels (db) between two sound levels being added

For comparison, some common noise levels are:

| | |
|---|---|
| Threshold of hearing of street noise | 8 db |
| Quiet whisper at 5 ft | 17 db |
| Quiet residence | 30 db |
| Average residence | 40 db |
| Quiet office | 43 db |
| Department store | 64 db |
| Riveter, at 35 ft | 103 db |
| Threshold of painful sound | 130 db |

MEMO

from: J.J. Williams, Chief Engineer
to: T.M. Hartnett, Plant Superintendent
subject: Plant Communication System

Tom,

After a thorough study of the subject, I think the Gai-Tronics system is our best bet. It would not only give us a superior speaker system, but, for only a few dollars more, a plant telephone system as well. The Gai-Tronics people offer to give us a demonstration right here in the plant. Let's take them up on it!

Jim

# *Right, Jim,* GAI-TRONICS GIVES YOU TWO COMMUNICATION SYSTEMS IN ONE

Only by choosing a GAI-TRONICS Power Plant Communication System, can you get a *complete* system—far more versatile than an ordinary public address hookup with an unhandy, separate intercom.

GAI-TRONICS Systems are *custom-engineered* by Power Plant Design Engineers—men who know the problems and needs of top-notch power plant communication. GAI-TRONICS speakers and telephone handsets are specially designed for power plant operation. Even under the highest and most unusual noise levels, hearing and speaking are easy, completely unstrained.

With but a flick of a switch it is possible to change from speaker use to personal two-party or group telephone conversation. No need for two individual systems—each with its own wiring, devices, maintenance, *and expense!*

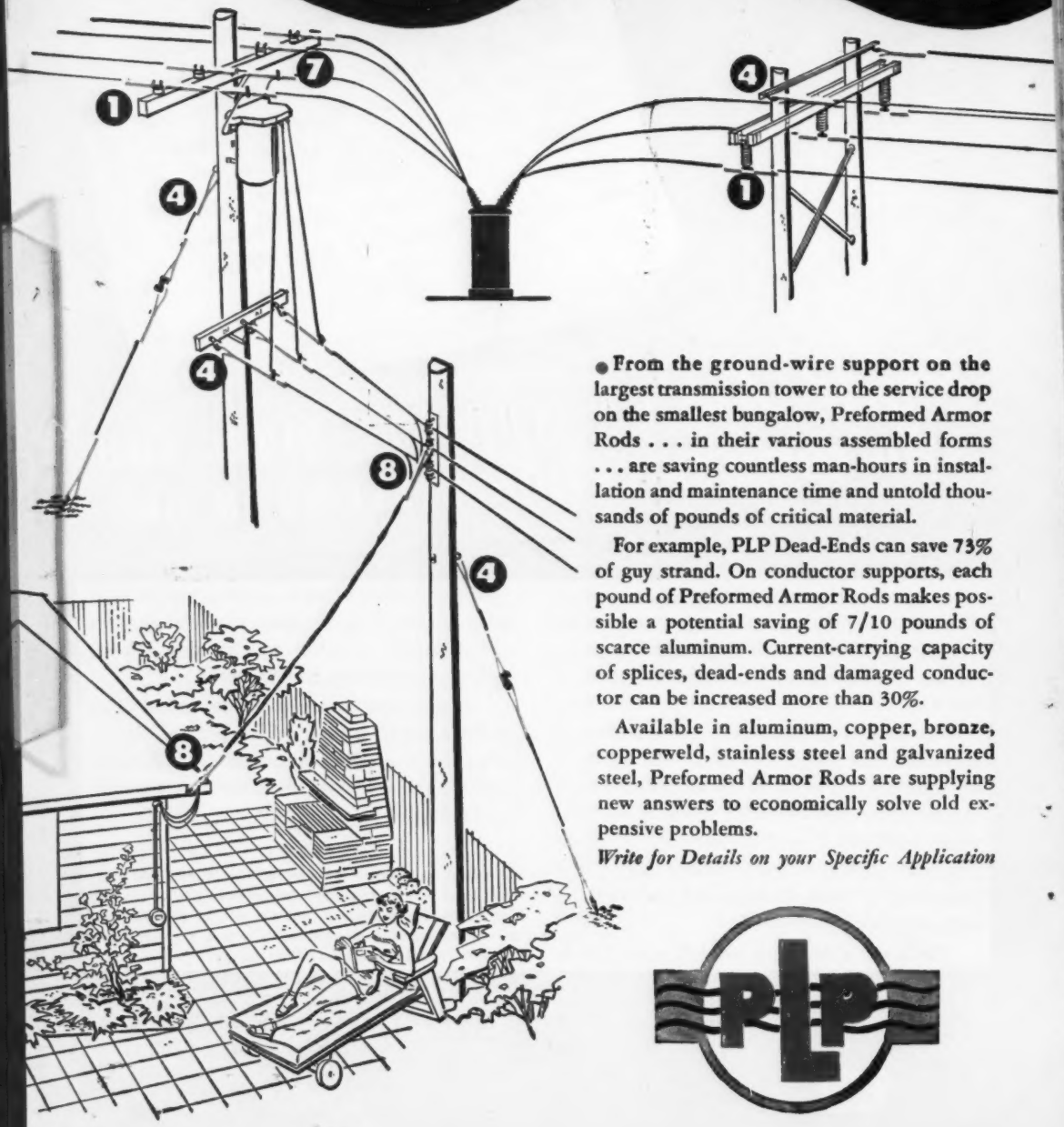
To everyday power plant operation, GAI-TRONICS brings a new standard of efficiency. During an emergency, *fast, sure* GAI-TRONICS communication can avert disaster—can more than pay for itself in a few minutes.

***FREE***

**We want you to know more about GAI-TRONICS. At your request, we will send you an informative booklet . . . *Power Plant Communication Systems.* OR, we will be glad to give you an eye-opening demonstration with a portable GAI-TRONICS System *in your plant!* Write today!**

GAI
FOUNDED 1926

# "Preformed" MEANS SAVINGS




● From the ground-wire support on the largest transmission tower to the service drop on the smallest bungalow, Preformed Armor Rods . . . in their various assembled forms . . . are saving countless man-hours in installation and maintenance time and untold thousands of pounds of critical material.

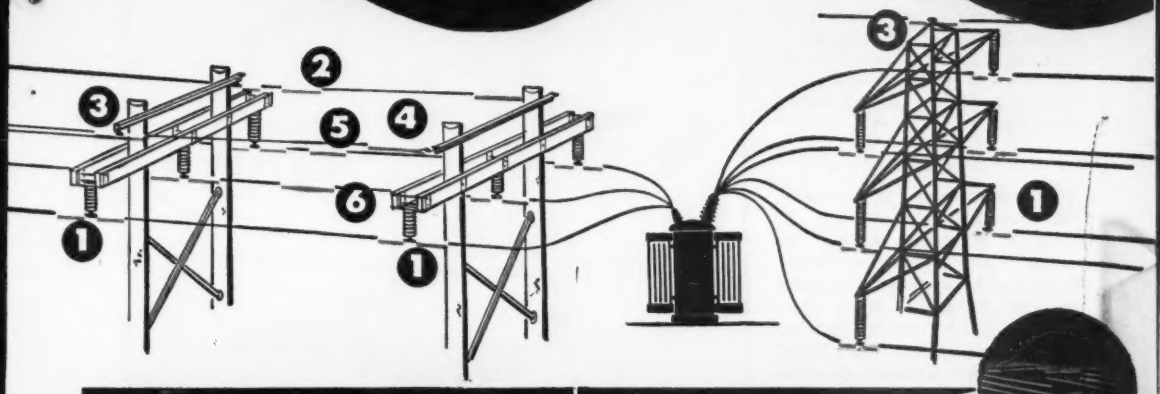
For example, PLP Dead-Ends can save 73% of guy strand. On conductor supports, each pound of Preformed Armor Rods makes possible a potential saving of 7/10 pounds of scarce aluminum. Current-carrying capacity of splices, dead-ends and damaged conductor can be increased more than 30%.

Available in aluminum, copper, bronze, copperweld, stainless steel and galvanized steel, Preformed Armor Rods are supplying new answers to economically solve old expensive problems.

*Write for Details on your Specific Application*

PLP

# ALL ALONG THE LINE . . . . .

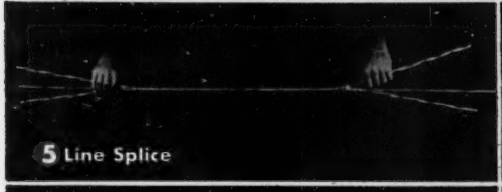


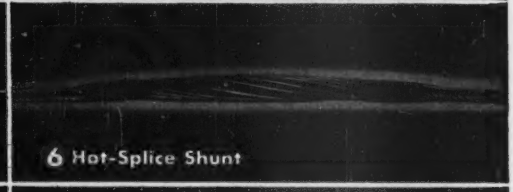
1 Support Armor

2 Repair Armor

3 Strand Armor

4 Dead-End


5 Line Splice


6 Hot-Splice Shunt

7 Hot-Line Tap

8 Service Drop Dead-End

**PREFORMED LINE PRODUCTS CO.**

5349 ST. CLAIR AVENUE CLEVELAND 3, OHIO

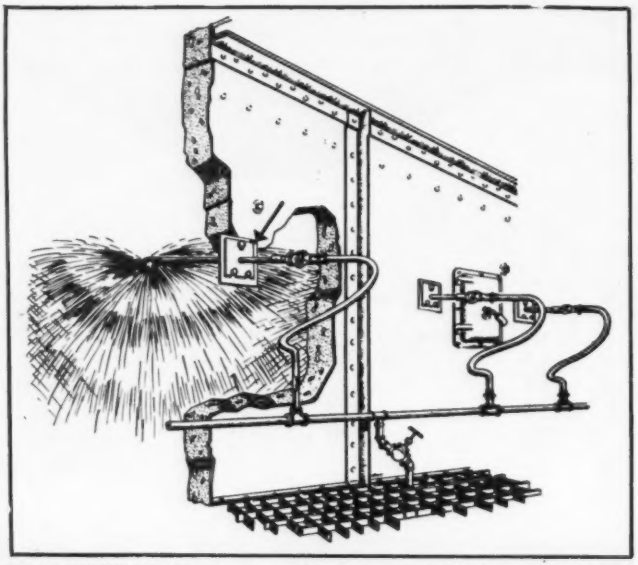
# Replace Quenching Sprays in 30 Seconds

**GEORGE J. HUBER**
**Asst. Superintendent, Philo Plant**
**The Ohio Power Co**
**Philo, Ohio**

A hopper-quenching spray has been designed which can be inspected, removed, or even replaced in less than 30 sec by the operator without the necessity of having to use any tools. Six sprays of this design have been installed in each ash-hopper in the Philo Plant.

### Lift Spray and Withdraw

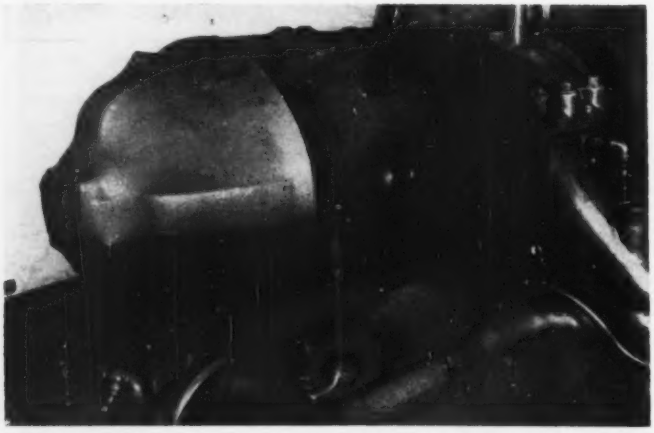
The illustration shows the mounting and connection of these sprays. By lifting the spray about one inch, the mounting plate is freed from the two bottom lugs so the spray can be pulled out to the edge of the hole for inspection. If it is found faulty, the water can be turned off, the "Quick Snap" connection which joins the hose to the spray assembly can be opened, and a spare spray put in place. A rack in the boiler room holds several spares. Since the sprays are of standard design, they are interchangeable with any one in the boiler room. Any one of a number of commercial spray nozzles can be used with this spray.



**SPRAY MOUNTING aids inspection and replacement. By lifting spray about 1 in., mounting plate (arrow) is freed from bottom lugs so that spray can be withdrawn**

These new ash-hopper sprays not only reduce maintenance and servicing expenses, but also give much safer working conditions which cannot be given a monetary value.

# Protect Stored Equipment with "Cocoons"



**MOTOR IN PLACE is easily and conveniently protected against deterioration during periods of non-use by sprayed-on plastic "cocoon." Spare motors, coils, and transformer windings also may be protected during storage in this manner. A Vinylite window may be placed in the covering to allow observation of equipment**

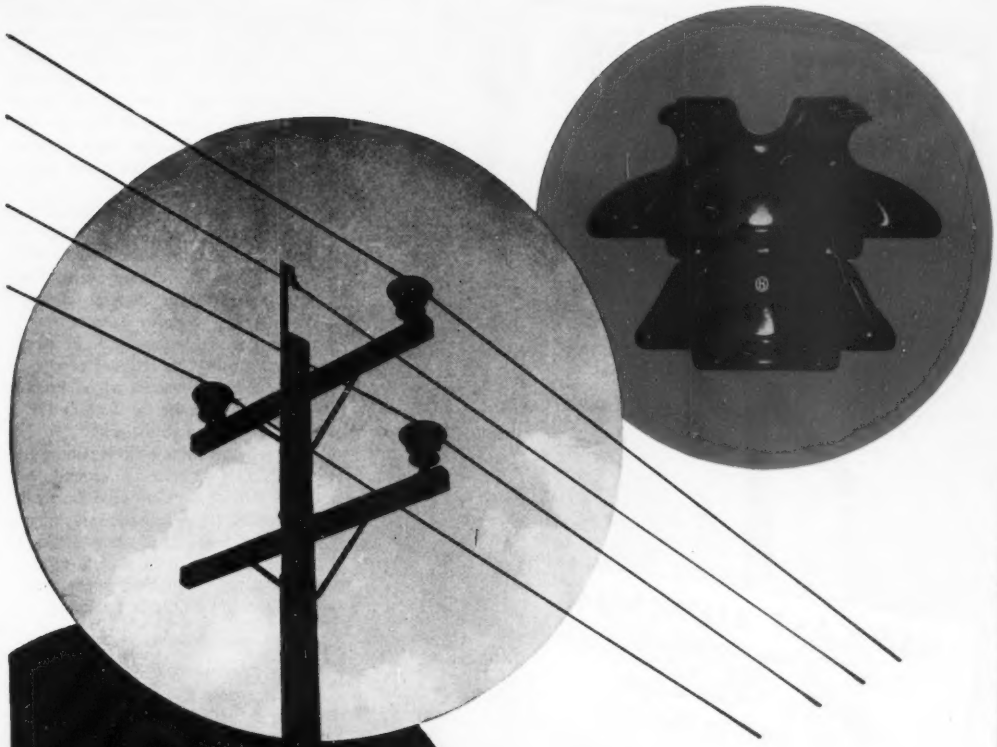
**D. A. CAMPBELL, JR.**

**Supt of Lines and Substations**
**Pennsylvania Power & Light Co**
**Hazleton, Pa.**

"Cocoons" of the type used by the armed forces are successfully protecting Pennsylvania Power and Light Co's stored equipment against deterioration. PP&L has spun cocoons around motors in place, spare motors, spare coils for rotating equipment, and replacement windings for transformers.

Equipment to be packaged for storage should be placed upon a skid or platform, and bolted to that platform if necessary. So that sharp corners of the equipment do not pierce the finished package, rag wads should be taped in place over sharp projections.

Masking or cotton tape is applied in strips connecting the outer projec-



**WHEN YOUR LINE MUST** *stay on the job*

## . . . . . Consider These Facts

Let's look at some *facts* on pintype insulator performance. This line was energized in 1917 at 44 kv, using 55-kv O-B pintypes. In 1920, voltage was raised to 69 kv on the same insulators. For 31 years the insulation has been living on part of its safety factor . . . The territory through which this line passes has an official 30-year average of 46.2 annual storm days. In the last five years, the first two of the 1,300 O-B pintypes have been replaced due to deterioration, although neither caused an interruption. Today, the line still handles an important industrial load . . . Thirty-four years of insulator service; 31 of which over-loaded -- more than 46 annual storm days -- only two replacements in 1,300 when the line was 29 years old, and these not causing an outage -- *facts* such as these point to the soundness of specifying O-B pintypes for lines that must stay on the job!

*Ohio Brass*

MANSFIELD • OHIO

4193-H

USE CAST ALUMINUM
TYPE "AS" SUSPENSION
and
TYPE "SD" STRAIN CLAMPS
ON ALUMINUM
TRANSMISSION LINES

STOP—Hysteresis and eddy current power losses.

PREVENT—Corrosion, heating and annealing damage to conductor within clamps.

ELIMINATE—Jumper splice failures—use through conductor strain clamps with continuous jumpers at strain points.

BE SURE—SPECIFY—Cast aluminum clamps with more than 25% greater strength.

Consult one of our nearest 18 representatives or contact our main office.

Backed by many years of coordinated electrical, mechanical and metallurgical engineering knowledge and experience in the design and manufacture of cast aluminum products for the electrical industry.

WRITE FOR
Catalog No. 320

OUR PRODUCTS ARE QUALITY CONTROLLED
FROM INGOT TO FINISHED PRODUCT

ANDERSON BRASS WORKS, Inc.
POST OFFICE DRAWER 2151
BIRMINGHAM, 1, ALABAMA

AND BUS SUPPORTS


tions of the equipment, first horizontally, then vertically, so as to provide taped grids with squares a maximum of 20 in. on a side. Squares 16 in. on a side have proven more practicable. This taping reduces the amount of packaging required and improves the appearance of the package.

Initial step is the application of the cocoon coating solution to which a webbing agent has been added. The mix is one part webbing agent, plus three parts cocoon coating solution. When sprayed from a standard spray gun at a distance of 20 to 30 in. from the equipment, this solution produces long web-like filaments which bridge over the gaps in the taped grid. They do not pass through the grid.

Spraying of these webs is continued until a film is built up around the equipment. This film need be only strong enough to withstand spraying of successive coats of coating solution without rupturing. It is soft to the touch, slightly rough in appearance, and about eight mils in thickness.

**Cocoon is Moisture Proof**

The first, or "webbing coat," is then reinforced and made an effective moisture barrier by successive applications of cocoon coating solution without any webbing agent. The reinforced coating is applied with quick over-and-back passes of the spray gun at approximately 15 in. from the webbing. This technique prevents the spray from boring holes in the webbing coat. After completely covering the webbing with a light coat, a heavier coating is applied. If desired, each coating may be colored differently to insure complete covering.

A third coat of coating solution, properly thinned with "Blending Liquid," is applied with a spray gun to desired thickness. White gasoline (without lead) may also be used as a thinning agent. Because of the inflammability of gasoline, the spray gun should be grounded to avoid static sparks.

If desired, a Vinylite window may be inserted. Before applying the third coat, a hole of required size is cut in the cocoon. A Vinylite patch one or two inches larger than the window is placed over the opening and sealed to the cocoon with masking tape. Paper is placed over the window and held in place with masking tape. The cocoon solution is then sprayed over the masking tape and paper. After

## ...TO GIVE YOU A CONTROL CABLE THAT AVERAGES* 46% SMALLER IN AREA

By teaming Polyethylene with Nylon on conductors — sheathing the cable with Rockhide — Rockbestos has developed a radically new and better control cable. It has high dielectric strength *plus* all the advantages of smaller size. As a result, you can put a 12 conductor cable in a conduit now carrying 6 or 7, or use smaller size conduit to save conduit fitting and installation costs. — Save steel.

It will pay you to get the PNR story. Write or ask your nearest Rockbestos representative.

*Average determined by comparison with competitive control cable.

### QUICK FACTS ON NEW ROCKBESTOS PNR CONTROL CABLE

46% smaller area* . . . 28% smaller diameter*. Use smaller conduit and fittings or put more conductors in present conduit.

Dielectric breakdown . . . over 40 times operating voltage.

Versatile . . . bury it in the ground! Hang it on a pole! Use it in a conduit!

Lighter and smaller. Easier to handle, store, ship, pull through conduit.

Stands weather . . . sunlight, chemicals, oil, gasoline, grease.

Flexible to —25°C (—13°F). No cracking!

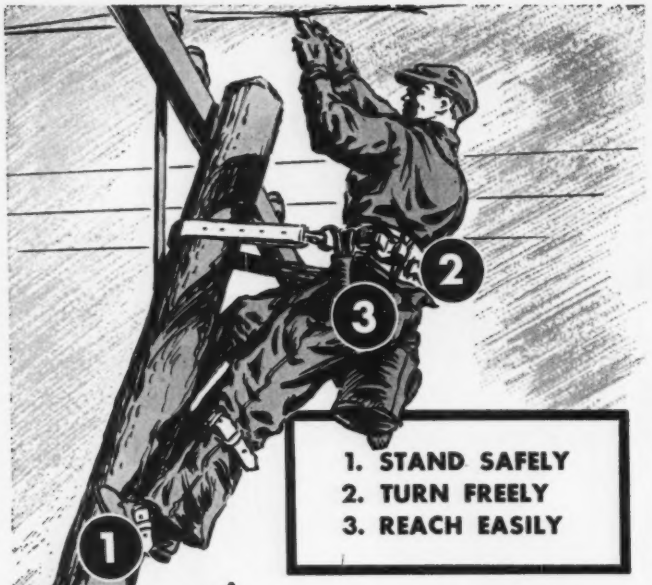
Rated 600 volts . . . conductor operating temperature 75°C (168°F).

## ROCKBESTOS PNR

*. . . another different, better cable by*

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONN.
*the originators of A. V. C.®*

New York · Pittsburgh · Cleveland · St. Louis · Detroit · Los Angeles · Chicago · Oakland, California




1. STAND SAFELY
2. TURN FREELY
3. REACH EASILY

*with* **BUCKINGHAM**
**Linemen's Equipment**

Every piece of Buckingham equipment is rigorously inspected for quality — rigorously tested for safety — field-proven for comfort and convenience. It's this *dependable* quality and workmanship that has kept Buckingham "on top" for more than half a century.

**Adjustable . . . Fits Any Man**

1 BUCKINGHAM CLIMBERS

Now — adjustable tops are optional on any type Buckingham Climber! Adjusts from size 15 to 18½—gives every lineman an exact fit, far more comfortable than standard ½-inch sized climbers. Saves on inventory — one pair fits every man on crew . . . practical as extra climbers for service truck, plant, substation. Typical Buckingham quality and safety.

**Turns 4½" Right or Left**

2 TOOL BELT No. 1060

Glider-type belt allows freer body movement — linemen can turn up to 4½" without constantly shifting feet, binding clothes or cramping tools. Stout, tan-colored harness leather, rolled-edge liner, tough stitching. Typical Buckingham safety and comfort.

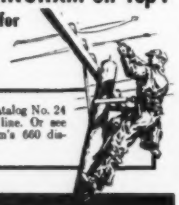
**"Custom-Made" for Linemen**

3 TOOL POUCH No. 4023

Best quality leather tool pouch—holds lineman's three most-used tools. Stoutly riveted. Fits belts up to 2" wide.

**That's BUCKINGHAM on Top!**

Second to none for
QUALITY
SAFETY
COMFORT



• Write for free Catalog No. 24 showing complete line. Or see one of Buckingham's 660 distributors.

**BUCKINGHAM MANUFACTURING CO., INC.**
1-3 TRAVIS AVE. BINGHAMTON, N. Y.


entirely completing the cocoon, the paper is cut away. Silica-gel may also be inserted in open containers just before putting in the window, to maintain a moisture-proof atmosphere inside the cocoon. A final coating of aluminum may be applied for outdoor storage.

To remove the plastic film, it may be slit with a knife and stripped off.

## Newer Methods of Using Chemical Weed Control

Some of the latest methods of applying "Ammate" (ammonium sulfamate) and 2,4-D and 2,4,5-T chemical weed killers are reviewed. Information has been made available by the du Pont Co and is supplemental to Engineering Reference Sheet No. 51-22 (EW, August 13, 1951, page 148).

Airplane applications of 2,4-D and 2,4,5-T for general brush control have not been satisfactorily developed (mesquite and sandsage excepted). Two methods of dormant treating which seem promising are (a) stump treatment with "Ammate" or a mixture of 2,4-D and 2,4,5-T and (b) basal stem treatment with 2,4-D and 2,4,5-T. These methods offer a longer season of operation with equipment and man power. Many contractors do brush cutting for utilities and the extra operation of treating stumps is incidental except for chemical cost.

A solution of 4 lb of "Ammate" per gallon is painted on the cut surface of the stump, or dry crystals are applied to notches made in the top of stump (⅛ lb per 6 in. diameter).

Use of 2,4-D and 2,4,5-T as a 50-50 mixture, provides from 50 to 70% control of sprouting, depending on species involved. Usual rates encountered in the field have been 1 to 2% 2,4,5-T ester by weight in diesel oil or 1.5 to 3% of 2,4-D and 2,4,5-T ester mixtures by weight in diesel oil. The higher concentrations usually provide better control; however, if lower concentrate was thoroughly applied to point of run-off, they would naturally apply about the same amount of active ingredient per stump.

Basal portion (ground level up to 12 in.) of stems is sprayed with 2,4,5-T or 2,4-D and 2,4,5-T mixtures. Concentrations used have been 2% of 2,4,5-T or 2 to 4% of 2,4-D and 2,4,5-T (50-50 mixture). Indications are that these products when applied

(*Continued on page* 142)

# REDUCE ALL 3 and get Higher Quality

1. Cable Cost
2. Installation Time
3. Frequency of Replacement

## By Switching to ANSONIA Ankoseal®

## ALL-PLASTIC, LIGHT-WEIGHT CABLE

**More and more utilities are switching to Ansonia Ankoseal for—**

Supervisory Control Cable
Station Control Cable
Street Lighting Cable
Meter Cable

**The resulting advantages are—**

lower cost in most cases
reduced installation time and effort
reduced frequency of replacement

We'll welcome an opportunity of demonstrating these advantages to you by showing actual service records of well-known public utilities.

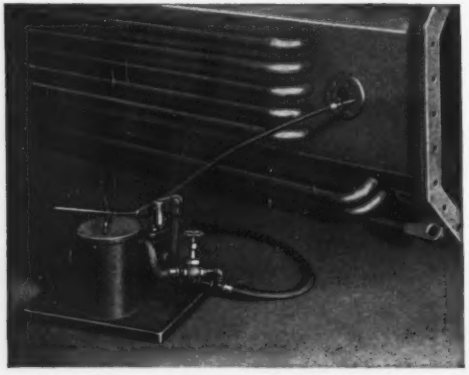
*Write for additional information.*

**THE ANSONIA ELECTRICAL COMPANY**
SUBSIDIARY OF NOMA ELECTRIC CORPORATION
ANSONIA, CONNECTICUT

Bases are formed from exceptionally heavy plate. Heavy structural steel channels and angles are welded to the steel base. Tanks can be provided with flanged or flat wheels—any desired gauge.

After the welding operations are completed, each transformer tank is "sandblasted" with steel grit which removes all plate scale and weld scale to provide a clean, solid base to which the paint will adhere.

All power transformer tanks are flow painted with three coats of paint—a primer coat, a bonding coat, and a heavy finishing coat. Each coat is thoroughly baked on the tank to assure a weather-resisting surface.



All tank covers, bushing mounting-flanges, radiator connections, and all welded joints are pressure-tested for possible leaks. Mounting bosses are tested with a very thin fluid at a pressure of 250 pounds per square inch.

# Wagner
## POWER TRANSFORMERS

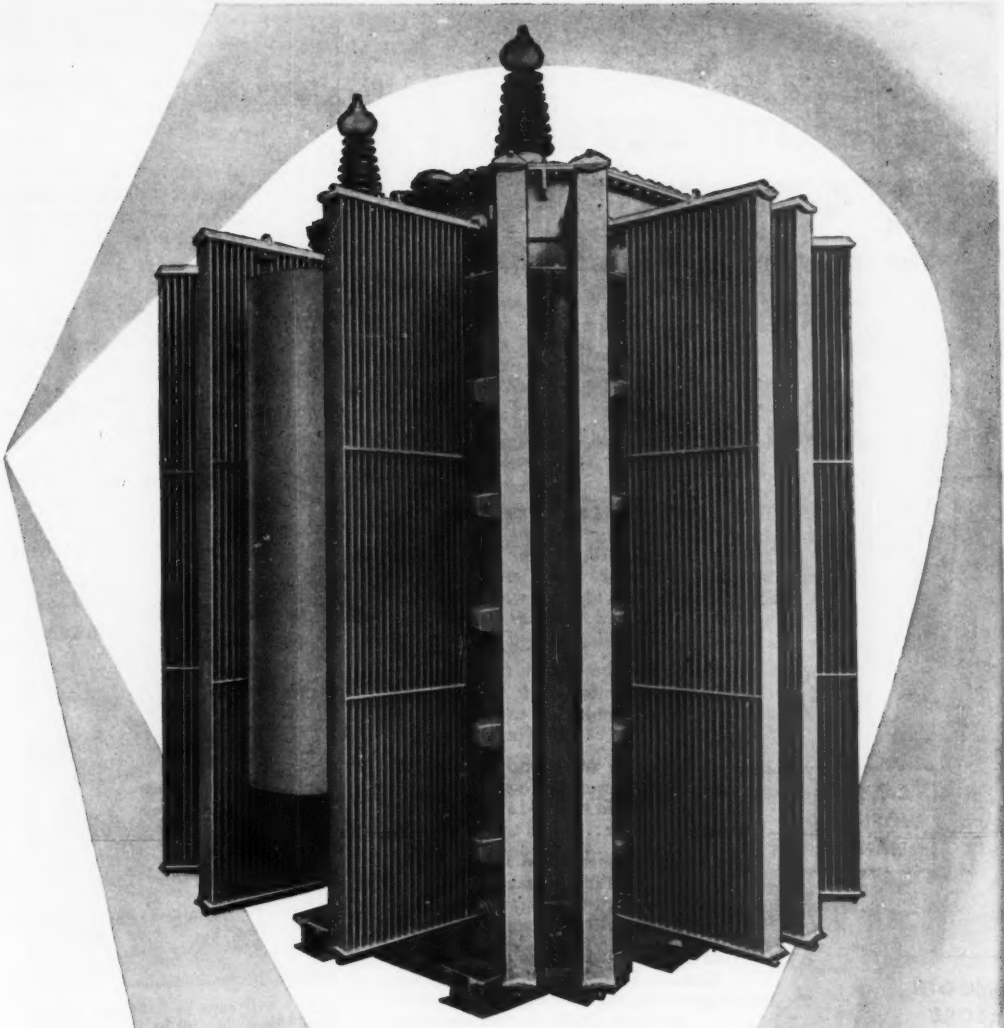
### *built to give extra value— in longer service life*

Wagner has the knowledge and facilities to make the building of power transformers part of the day's work—knowledge and facilities gained in sixty years of transformer manufacturing.

Engineering experience, the use of only the highest quality materials, carefully controlled production methods, and rigid inspections and tests all combine to give Wagner Power Transformers the ability to give extra value—in longer service life.

The unusual care exercised in tank construction is typical of the way in which additional years of service are built into Wagner Transformers. All parts used in fabricating these transformers are formed of heavy steel-plate. The formed parts are electrically welded into an integral unit, then are sandblasted and painted.

® Wagner Electric Corporation
1891 1951



Wagner Power Transformers have a reputation for quality — well-known to our utility and industrial customers.

Liberal design, coupled with painstaking care in manufacture, give them the stamina to maintain a continuous flow of power, even under the frequent overloads demanded by today's requirements on system capacity.

Users of power transformers will find it to their advantage to consult Wagner engineers on their next transformer installation. Thirty-one branch offices, located in principal cities, are at your service. Bulletins TU-180 and TU-181 give information on the complete line of Wagner Transformers.

**WAGNER ELECTRIC CORPORATION**

6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

**BRANCHES IN 31 PRINCIPAL CITIES**

TS-12

SMOOTH BORE CONDUIT

for safe, quick pull-throughs—

with BERMICO®

8-FT. LENGTHS

You won't have to worry about short-circuits caused by sheath abrasion when you do your fishing through Bermico Fibre Conduit. The unusually smooth bore of its 8-foot lengths provides a continuous raceway through which cable and wires can be speedily drawn—without injury to their coverings.

Another advantage is Bermico's **Complete Line of Bends,** which, with 5° angle couplings, enables you to meet unusual field conditions.

EASY TO WORK AND HANDLE

Bermico is **Easy to Work and Handle,** too. Its long lightweight lengths can be cut and tooled right in the field . . . make work easier . . . speed up installation.

You get **High Mechanical Strength** with Bermico. Tough and resilient, it offers best possible protection against accidental damage to wiring.

SMOOTH BORE

On your next job, plan to use Bermico Fibre Conduit. Its durability, safety and low maintenance cost will provide savings which will pay dividends over the years.

BERMICO ELECTRICAL CONDUIT

*Distributed by*

WESTINGHOUSE

Electric Supply Company

Offices in all leading cities

A PRODUCT OF BROWN Company

Berlin, NEW HAMPSHIRE

KOLEX & CELLATE PULPS • KOLEX-FLOC • NIBROC PAPERS
NIBROC TOWELS • NIBROC KOWTOWLS • BERMICO
SEWER PIPE, CONDUIT & CORE • ONCO
INSULEX • CHEMICALS


## Weed Control

(*Continued from page* 138)

as basal treatments are more effective on species tolerant to these products as foliage sprays (example — red maple).

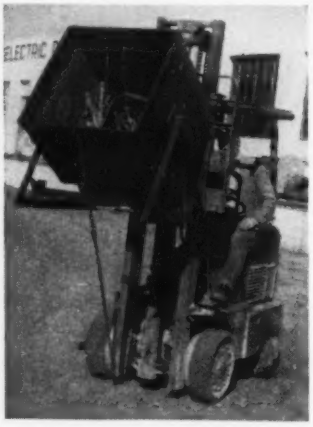
Chemical cost is comparable to foliage application. Labor required to make basal stem applications can be a major deterrant to practical use of this method.

## Handle Scrap Easily With Pallet-Mounted Bin

A. J. SCOTT

General Store Keeper
California Electric Power Co
Riverside, Calif.

To handle scrap iron with a minimum of labor, California Electric Power Co has built a pallet-mounted bin. The bin is lifted, moved, and dumped by a standard fork truck.

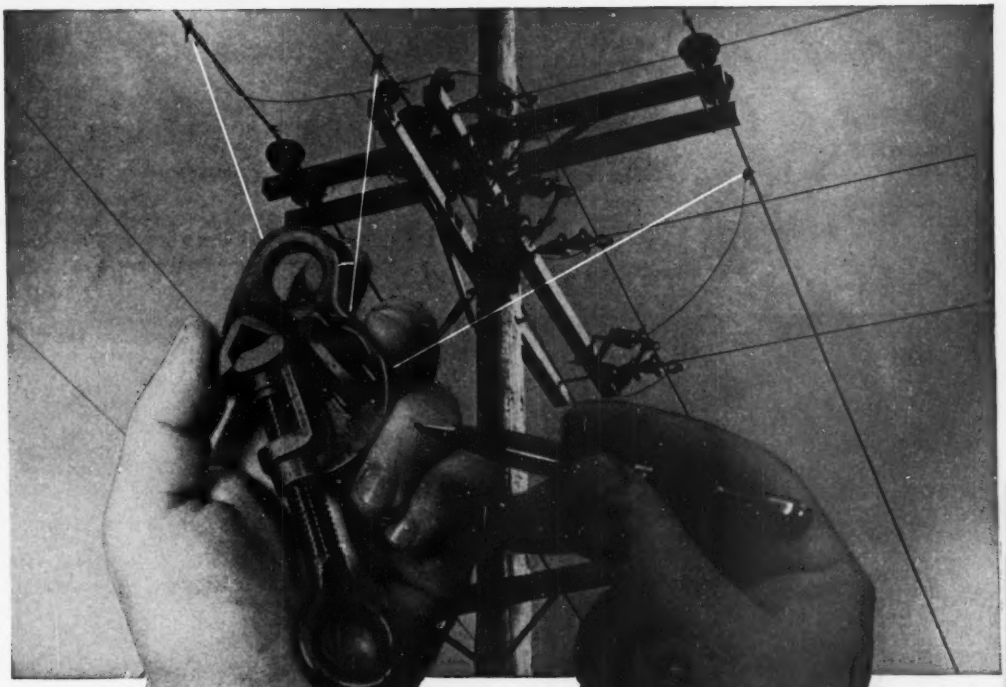


**SCRAP BIN built by California Electric Power Co is handled by fork truck and dumps automatically when elevated**

Pivot mounting and a chain attached to the truck provide automatic dumping as the bin is elevated.

The bin is used to accumulate scrap iron in the general stores division. It normally rests on the floor with a pair of movable dogs blocking it from swinging on its pivoted supports. When it is picked up after being filled, or when scrap is being collected, the dogs are rotated out of the way, allowing it to pivot about its supports for dumping.

Total cost of the bin, which was fabricated entirely from scrap, was about $25 worth of labor.



# the MOST IMPORTANT SPOT on the line deserves the BEST you can get

## Chance Perma-Grip Clamps withstand surge currents — protect the conductor

When fault currents or heavy surges burn conductors, it invariably happens at the *point of contact* between main line and jumper—the most vulnerable spot on the line. This won't happen *if* the clamp makes sufficient contact with the conductor and if its current carrying capacity is greater than that of the jumper.

That's why it pays to *be extra selective* in the tap clamps you buy. *Put design and quality first.* Insist on Perma-Grip Clamps with THREE POINT CONTACT jaws that make better contacts on all wire sizes and that contact more strands on stranded conductor.

You will *also* get high *mechanical strength* combined with *high conductivity* — tap clamps with ability to withstand the torques necessary for good, tight applications and with stamina to hold indefinitely under strain—*plus* clamps that, regardless of size, have higher surge capacity or conductivity than the maximum jumper you can use with them. Perma-Grip bodies are cast of copper alloys or heat treated aluminum alloys selected to give you the *best possible combination of strength and conductivity.* U. S. S. threads screw up fast and hold tight with less tendency to freeze on the line when corrosion attacks.

Be sure you get the *best* for this important job—insist on the original Chance PERMA-GRIP Tap Clamps . . . proved in service for nearly twenty years.

Chance Perma-Grip Clamps are made for tapping to aluminum, copper, or steel conductors and are available in a complete range of sizes to meet all requirements.

*Look for these features:*

3 POINT CONTACT

HIGH PRESSURE JUMPER CONTACT

Guard the most important spot on your lines by using Genuine Chance Perma-Grip Clamps.

ABC INDUSTRIES

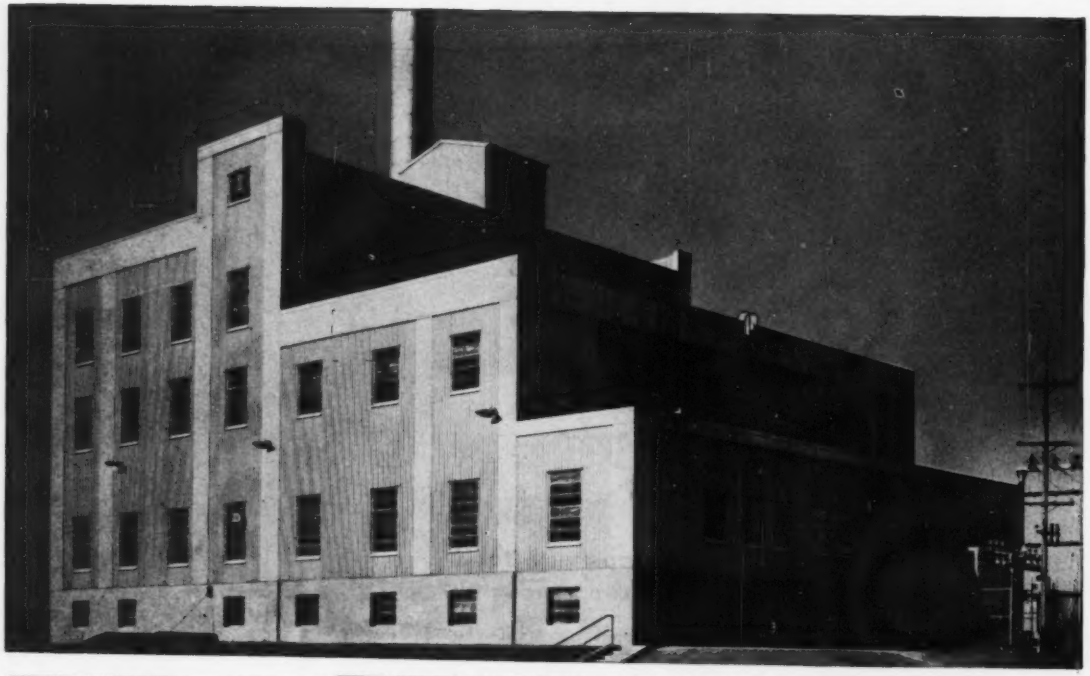
*You know it's RIGHT when you specify CHANCE*

A·B·CHANCE CO.

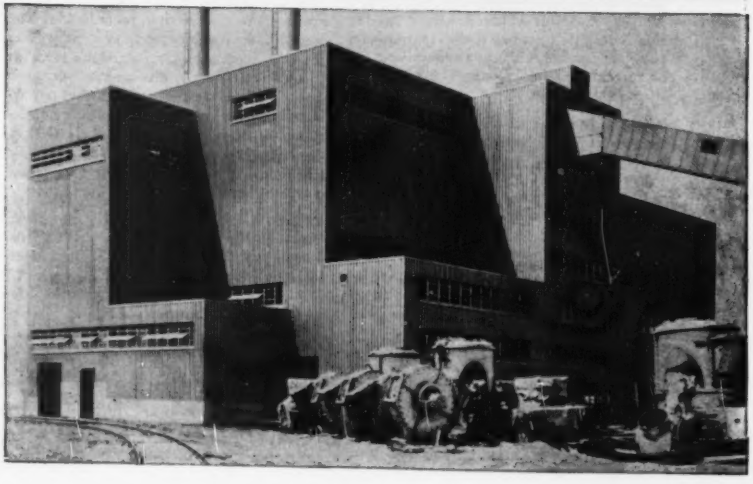
CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

# *Available for your*

## Walls of Stainless Steel offer



▲ 21,000 sq. ft. of Stainless Steel were used in the walls of this new power station built for the Northern States Power Company, Minot, N. D. Designed by Pioneer Service and Engineering Company, Chicago. Wall materials were fabricated and erected by The R. C. Mahon Company, Detroit, Michigan.



▶ William J. Neal Station was erected last winter with temperatures ranging from 10° above to 50° below zero for Central Power Cooperative, Inc., Voltaire, N. D. Erection of 44,900 sq. ft. of Stainless Steel walls presented no difficulty even in such low temperatures. Designed by Vern E. Alden Company, Chicago. Wall materials were fabricated and erected by The R. C. Mahon Company, Detroit.

# *current projects...*

## economy and long life for power plants and other buildings

●*If you're planning construction* of a new power plant or any other building, it will pay you to give Stainless Steel serious consideration as a wall material. Contrary to what you may have heard, Stainless Steel is available today for this type of application.

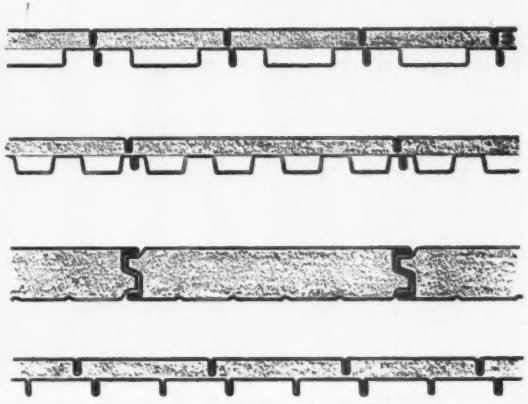
Shortages of certain alloying elements, notably nickel, have greatly limited supplies of some Stainless grades. But straight-chromium grades, including U·S·S 17 (Type 430) and U·S·S 12 (Type 410), are relatively plentiful and are well suited to this type of architectural application. In fact, three new multi-story office buildings in Pittsburgh's impressive Gateway Center are being built with exteriors of Type 430 Stainless.

As a result, you have at your immediate disposal all the advantages of Stainless Steel wall construction —simplified construction, minimum cost-per-year in maintenance and clean, modern lines.

The strength and durability of Stainless Steel, combined with its exceptional corrosion resistance, make it a truly permanent building material. When you spread its original cost over the life of the building and take into account the almost complete freedom from maintenance, cost-per-year is astoundingly low. And the first cost of this construction is often lower than that of masonry walls.

Erection is simple with panels in interlocking sections 12 to 24 inches wide. Insulation to meet any building code requirement is applied to the panels before erection, giving you an extremely low heat transmission coefficient. United States Steel does not sell fabricated Stainless Steel panels. It supplies Stainless Steel sheets to panel manufacturers for fabrication in a variety of forms. But we will be glad to furnish you with details on this type of construction and refer you to leading panel manufacturers for additional information. Use the coupon at right.

**Typical cross-sections of insulated Stainless Steel walls of various wall manufacturers**



United States Steel Corporation Subsidiaries
Room 4315, 525 William Penn Place
Pittsburgh 30, Pa.

☐ Please send me your booklet "U·S·S Stainless Steel for Walls and Roofs of Industrial Buildings."

*☐ Please arrange to have your customers send me literature on their particular type of Stainless Steel roof and wall panels.

Name..... Title.....

Address.....

City..... State.....

*United States Steel is the producer of U·S·S Stainless Steel sheet and strip, not a maker of formed roof and wall panels. These are manufactured by a number of our customers.

AMERICAN STEEL & WIRE COMPANY, CLEVELAND · COLUMBIA STEEL COMPANY, SAN FRANCISCO
NATIONAL TUBE COMPANY, PITTSBURGH · TENNESSEE COAL, IRON & RAILROAD COMPANY, FAIRFIELD, ALA. · UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

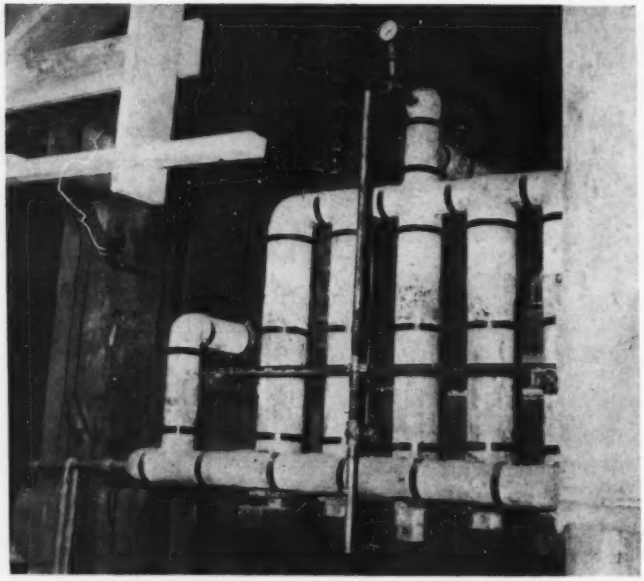
**U·S·S STAINLESS STEEL**

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

1-1907-A

UNITED STATES STEEL

# Electric Heat for Molasses Tank Reduces Fire Hazard



**ELECTRIC HEATING elements totaling 20 kw eliminate previously-used fuel fired boiler labor, fuel problems, and fire hazards in heating molasses for feed mix. Automatic control, complete safety, and assurance against overheating are provided**

**HUGH S. EVANS, Jr**
**Power Sales Dept**
**Nashville Electric Service**
**Nashville, Tenn.**

The Sunshine Feed Mill at Nashville, Tenn., now uses electricity to heat the molasses mixed into feed. Electricity was chosen primarily because its use eliminated completely the fuel fired boiler previously used with its attendant labor and fuel problems and fire hazards. Since other fuels are more than competitive on a Btu basis, electricity had to "pay its way" to get in. After a careful analysis of all cost features involved in such an installation there was no doubt about its being the only fuel to use. Electricity offered the elimination of direct labor and any fire hazard plus automatic control, complete safety, and assurance against overheating.

Heating molasses is usually a very touchy business because the heat input per unit of area must be kept quite low to avoid carbonization on the heating surface. This applies to both immersion and clamp-on type heaters and is the reason why steam is ordinarily used for such an application. In choosing the type of heat to be used the limitation on heat rate was a major factor and this eliminated straight immersion heater since low watt density heaters cost considerably more per kw than standard ratings. In the final analysis the customer selected hot water heat, using natural convection currents to circulate the heat through the steam coils already in the tank. While the pipe coils do not have as great a heat release as with steam this was not too important since the tank is quite old and present use of molasses is much less than tank capacity.

Only two of the five electric heating elements have integral thermostats, the others being manually controlled since they care for the minimum heat requirements. All heaters are not of the same wattage. This system is unique in that city water is led to the heating manifold and the heated water circulates through the pipe coils and returns to the bottom header. No check valve was installed on the cold water line and so water expansion is no problem but where the plumbing code requires the use of a check valve an expansion tank must be provided. A relief valve is necessary if it's possible to valve off the system.

A 3 gpm maximum of molasses flows through a 4 ft diam by 4 ft high tank and is heated to 80 F by a total input of 20 kw.

## Handling Costs Down 50% With Electric Fork Truck

Baker-Rauling Co

**BALE STACKING by 1,000 lb capacity electric fork truck has cut bale-handling costs 50% at Green River Mills, Inc, Tuxedo, N. C. Storage is upped 10%**

# Infrared Oven Speeds Drying and Saves Space

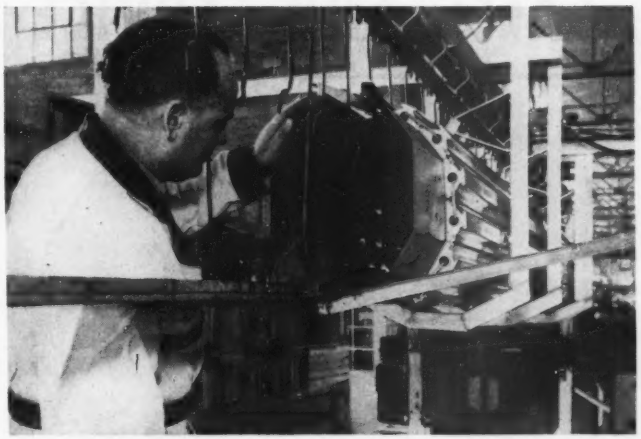
**ROBERT B. MERTZ**
**Industrial Representative**
**Cleveland Electric Illuminating Co**

Perfect results from a versatile, new infrared oven are reported by Lake City Malleable, Inc, Ashtabula, Ohio. Whether it is used to put a sealer coat on castings, for rustproofing, or for finish painting, company officials report the oven does the job speedily and economically.

It is made up of three units in three banks, with 12 heaters to a bank. Parabolic reflectors arranged in a circle are used to get maximum coverage on the product. As presently set up, the oven handles 1200 medium-sized pieces per hour. Size and shape of the oven can be changed to fit the piece.

Each of the three banks is controlled by percentage timers. These regulate the amount heaters are energized each 30 sec, thereby determining the amount of radiated heat on the product and providing flexibility to the oven for many types of finishes and for a variety of casting shapes and sizes.

Drying cycle can be varied. At conveyor speed of 12.5 ft per min, it is 2 min. Each of the heater banks can be set for a different temperature if certain applications require it.



**RADIANT INFRARED oven handles 1200 medium-size pieces per hr. Size and shape of oven can easily be changed to fit the piece. No drying racks needed**

The oven also compensates for changes in humidity which ordinarily would affect the drying rate. Drying speed of the oven is a big space-saving factor. No space is needed for drying racks. The entire finishing operation is centered in the shipping department. When parts leave the last bank of heaters, they are ready for immediate packing and shipment. Company officials attribute additional economy of operation to the low maintenance cost for the oven.

## INDUSTRIAL BRIEFS

**Fast Sorting** of 25,000 motor shafts by a metals comparator when intermixed in truck delivery was achieved at General Electric's Fort Wayne Works under emergency conditions. Instrument is portable and identifies both magnetic and non-magnetic metals. It separates machinable parts of cold-rolled steel from non-machinable parts made of stainless steel; can assure use of specified metals looking alike but differing in hardness, heat treatment, or chemical composition; and also for work with aluminum, copper, and bronze. Specially trained operators are not needed for its operation.

**Space Heating** for chlorination equipment rooms at International Silver Company's private reservoir keeps them at 60 F from November to May in Meriden, Conn. A 1,320-w electric heater is used in a 5 x 8 x 8-ft room. A 4 x 4 x 8-ft valve room is kept at 40 F by a 660-w heater. Both operate on thermostat control. Rooms are in a 10-ft square gate house with brick walls, ceiling with 4 in. of rock wool insulation, concrete floor, and double glass windows. Maintenance has been cut (kerosene lamps provided the former heating) and maximum safety against fire obtained. Average heating cost was about $70 in three seasons.

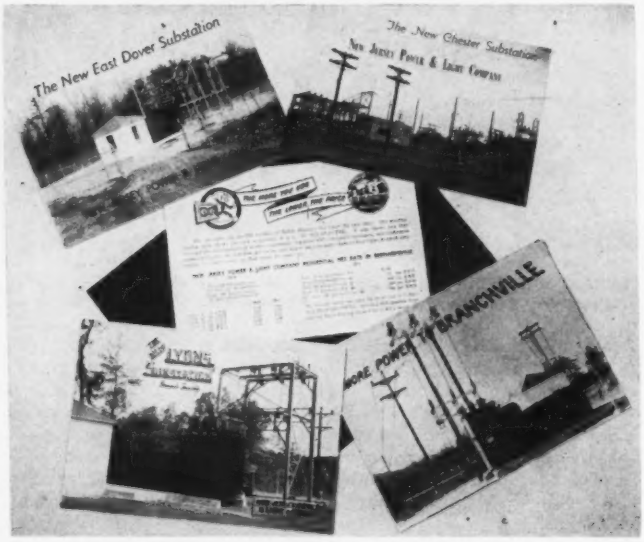
**Paint Drying** of touch-up lacquer work is speeded with a portable infrared lamp dryer at Harvey Golden, Inc, Reading, Pa. Dryer has six 250-w infrared lamps and is especially advantageous during damp weather, since only 15 to 20 min is required for touch-up drying which otherwise would take 3-5 hr. All "blushing" of lacquer is eliminated by this method. Finish produced is more uniform and has more luster than with normal air drying. Dryer is also handy for drying out automobile door panels where moisture has collected. This job is quickly accomplished without damage to fabric or covers.

**Heating Plastic** preforms by dielectric heating is fastest and most economical method in manufacture of plastic parts at Squires Plastics, Inc, Verona, Pa. Preforms are heated uniformly throughout and molding materials are free from surface "crust" or hard lumps. Phenolic resin preforms are heated to 275 F in about 45 sec in 25-kw dielectric heaters. Other methods require more time, possibly hours more. Preforms are then placed in hydraulic press where parts are formed under heat and pressure. Platens of press are heated to 350 F by nine 1,000-w electric strip heaters. J. R. Taylor, Industrial Representative, Duquesne Light Co, Pittsburgh, Pa.

# SALES AND SERVICE

**RESIDENTIAL • RURAL COMMERCIAL**

## Brochures Keep Customers Informed of Improved Service


The New East Dover Substation
The New Chester Substation
New Jersey Power & Light Company
LYONS SUBSTATION
MORE POWER TO BRANCHVILLE

**BROCHURES OF NEW SUBSTATIONS** carry messages of better service to customers supplied in the area as soon as new substation is tied to company's system

How to keep its customers informed on what the company is doing to give more and better service is at least partially answered by New Jersey Power & Light Co's application of that old saying, "One picture is worth a thousand words."

As each newly constructed substation is added to the company's system, the Public Relations Department prepares for distribution a 4-page, 5½ x 7-in. brochure. The front page always pictures the substation emphasizing "New" or "More Power" as shown in the composite illustration. The back page is devoted to a comparison of the rates when New Jersey Power & Light Co entered the territory and today's rates. Obviously the comparison is flattering because today's rates are lower.

The inside spread generally shows one or two local pictures of historic interest with brief mention of them; has one or two paragraphs describing the new substation; and closes with a goodwill gesture "The new substation is evidence of the company's desire to give our customers ever-improved, dependable electric service and to help them enjoy the fullest benefits of ALL-ELECTRIC LIVING."

The brochures are delivered by meter readers on their regular calls to customers who will be served from the new substation.

To date, 13 new substations have been so publicized and the company intends to continue the practice for substations now under construction or in the blueprint stage.

Customers seem to like the personal approach of a company employee whom they most always know (the territory is largely rural or small town) and often compliment him on his company's evident desire to give the best possible service.

## Lighting Improvements Sold by Cold Canvass

**STELLA M. FETZER**
**Home Lighting Department**
**Cincinnati Gas & Electric Co**

Cincinnati Gas & Electric's Home Lighting Division has found that a cold canvass in home lighting modernization produces results that far surpass their past performance by strictly appointment work. One home lighting advisor in door-to-door canvass has modernized as high as 12 lamps in one day.

The cold canvass program of modernizing table lamps in homes has been in operation for the past year. Lamps are modernized by using the R-40, 150-watt indirect White Lite single-filament bulb and the large harp. The cold canvass method enables advisors to make more calls per day. The average is 4.3 demonstrations per day.

Two advisors work from one car. Each pair is assigned to a certain territory. One advisor works one side of a street, her partner the opposite side.

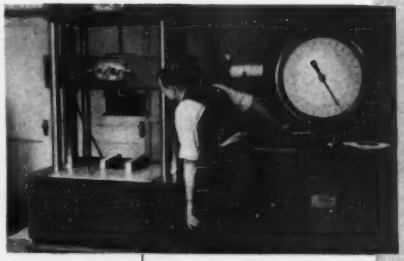
They work eight hours a day and five days a week. Contacts are made among the middle to lower income homes. To facilitate the operation bulbs and adapter equipment are sold from the cars. This enables the advisor to install equipment to help light condition the home at the time she makes her demonstration.

She carries a grey leather kit with an assortment of bulbs for lighting

# *Why Grinnell is America's #1 Supplier of* PIPE HANGERS *and* SUPPORTS

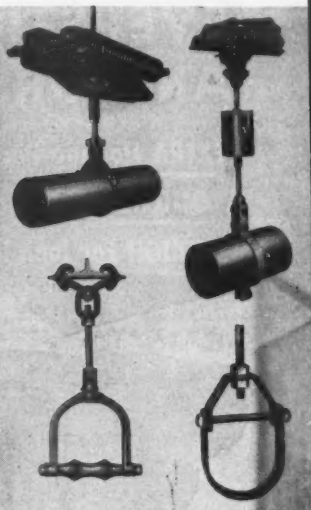
**GRINNELL, ALONE, MANUFACTURES A FULL LINE OF HANGERS AND SUPPORTS**

No other company, anywhere, makes a line as complete or varied. Grinnell produces hangers in thousands of combinations to support any piping.

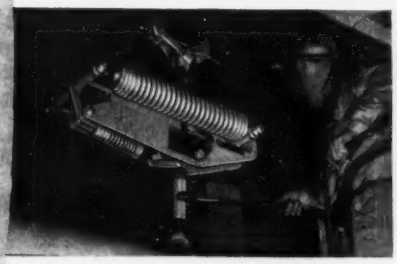


**GRINNELL, ALONE, MAINTAINS AN EXPERIENCED LABORATORY STAFF OF TRAINED TECHNICIANS**

In its modern, well-equipped laboratory, tests are constantly being made to discover better ways of solving old and new pipe suspension problems.



Grinnell makes scientifically designed, ruggedly built pipe hangers and supports for every type installation.



**GRINNELL, ALONE, PROVIDES ENGINEERING ASSISTANCE IN DESIGN AND INSTALLATION**

Grinnell makes available specialized knowledge in the computation of hanger loads and the selection of the correct supports. Engineers in the field assist with problems in erection of pipe hangers.

**GRINNELL, ALONE, THROUGH ITS CONVENIENT WAREHOUSES CAN SUPPLY YOU "OUT OF STOCK"**

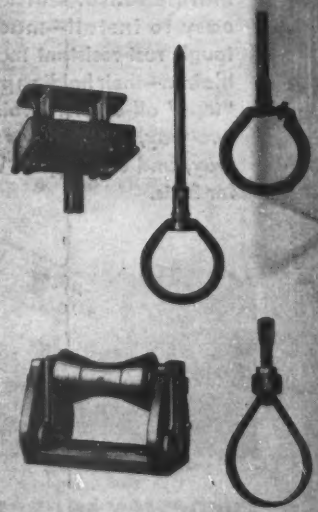
No manufacturer of pipe hangers offers a distribution system as thorough or efficient. Grinnell warehouses are located in 30 principal cities . . . with jobbers in practically every city, coast to coast.

Pipe suspension presents an extremely wide range of problems involving weights, stress, thermal movement, materials and specialized engineering. No one "goes into" the pipe hanger business overnight. Large manufacturing facilities, skilled technicians, and a lot of down-to-earth practical experience are needed.

Grinnell has become America's No. 1 supplier of pipe hangers and supports only because Grinnell has specialized in piping for one hundred years. Grinnell has developed a line of pipe hangers and supports for every piping requirement, from the simplest to the most complex.

Grinnell is always ready to co-operate with engineers and architects in the preparation of pipe suspension specifications.

Call Grinnell for any and all types of pipe hangers and supports.



# GRINNELL

**WHENEVER PIPING IS INVOLVED**

Grinnell Company, Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports
Thermolier unit heaters • valves • Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies • industrial supplies
Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

**ADVISORS KIT has an assortment of bulbs and such equipment as a six foot rule, light meter, threaded harp, under socket harp, Academy plugs, and other supplies**

modernization and such equipment as a six foot rule, light meter, under-socket harp, threaded harp, Academy plugs, and other necessary supplies. An additional supply of single filament and three-way bulbs, GA 50's, R-40's, silvered bowl bulbs, harps, socket extensions, and other equipment is carried in the trunk of the car. Her tool kit contains electrician's scissors, knife, pliers, two screw drivers, household cement, six small nuts, and shade risers. She also carries a book of photographs of various lighting installations, photographs of various types of fixtures, and pieces of literature which are left with the customers.

If the customer wishes she may charge the equipment on her electric bill, with a one-two-three months billing depending upon the total bill. The new 150-watt Kitchen Lite is given to all customers having the bowl type kitchen unit.

Figures pertaining to this operation for 794 advisor days for the period of April 1950 thru April 1951 are given in the table. The number of advisor days are determined by the number of advisors working a certain number of days i.e., six advisors making calls six days—36 advisor days.

In addition to the door to door activity many hours were spent on home shows, home lighting promotional work, light and sight classes in schools, county fairs, homemakers groups, 4-H groups, group demonstrations in the homes—bringing the modernization story, and many others. Advisors also spend many days working with PTA and other club groups on card party teas which are conducted in the auditorium of the company. Many direct request calls resulted from these activities.

**Total Demonstrations and Equipment Sold in 794 Advisors Days Between April 1950 and April 1951**

| | |
|---|---|
| No. Demonstrations | 3,407 |
| Additional Watts Recommended | 1,797,473 |
| No. Original Installations | 2,099 |
| Watts Installed—Original Installations | 507,867 |
| R-40 150 Watt Bulb | 1,737 |
| 40 Watt Outside Frosted Bulb | 44 |
| 100 Watt Deluxe Bulb | 1,450 |
| 150 Watt Bulb | 923 |
| 60 Watt Enameled White Bulb | 2,892 |
| 300 Watt Variable Bulb | 343 |
| 150 Watt Variable Bulb | 284 |
| 150 Watt Silvered Bowl Bulb | 9 |
| GA-50 Watt Bulb | 1,917 |
| 250 Watt Bulb | 59 |
| Harps Sold | 1,715 |
| No. Conversions | 1,705 |

• New information on the electric water heater market that may profitably lead to a revaluation of accepted dealer practices of merchandising this appliance has been brought to light in a national survey based on personal interviews with users. The survey was

# WHY VICTOR PINTYPES KEEP DISTRIBUTION COSTS DOWN

**V RUGGED, THICK CROSS SECTION** gives maximum strength and resistance to impact.

**V LARGE RADIUS TOP AND SIDE WIRE GROOVES** make hot-tieing easy and quick.

**V SMOOTH CONTOUR** *plus* smooth, hard glaze give unsurpassed self-cleaning characteristics—ideal for contaminated areas.

**V MAXIMUM LEAKAGE DISTANCE** conserves current, helps maintain rated voltage, and minimizes outages.

**V EACH VICTOR LOW-VOLTAGE PINTYPE** is individually inspected at every point of manufacture.

**V HIGHEST QUALITY WET PROCESS PORCELAIN** provides highest dielectric and physical strength.

VICTOR NO. 5 LOW-VOLTAGE PINTYPE. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

**These are only a few of the reasons why VICTOR Low Voltage Pintype Insulators are famous for performance *and* economy. They last longer—give *extra* years of service—cut line maintenance costs to a minimum. Power men everywhere prefer VICTOR Pintypes!**

*Do You Know that...*

The first wet process porcelain insulators were produced at Victor in 1893. In fact, many of our skilled craftsmen have been making high quality porcelain insulators at Victor for over 40 years.

*Specify*

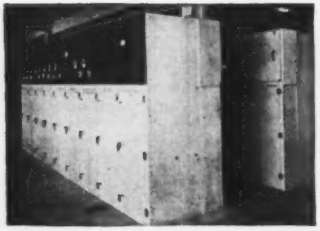
# VICTOR PINTYPE INSULATORS

**VICTOR INSULATORS, INC. VICTOR, N. Y.**

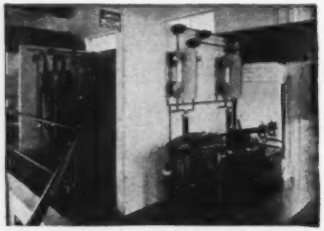
## WHY STATION EXPANSION PROGRESSES FASTER . . . COSTS LESS

## with Trancell Materials

If you're planning to expand your power stations or substation facilities, do what many leading power companies have already done . . . make your station change-overs with Johns-Manville Trancell Materials.



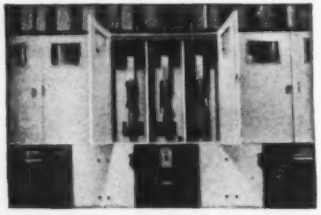
**They're safe**—fireproof . . . have low heat conductivity . . . adequately isolate high-voltage apparatus.



**They're neat**—make clean, flush-type housings, panels, doors, and partitions.

**They're handy**—easily cut and drilled on the job, or furnished cut to your specifications.

**They're durable**—rotproof and rustproof . . . will last for years. Require a minimum of maintenance.



**They're economical**—light, easy to handle and assemble. Have excellent re-use value.

**—for all high voltage power equipment enclosures**—Johns-Manville Trancell Materials are made in many sizes and types. Recommended for transformer and switch gear housings and partitions; bus bar enclosures and other services. For further information write to Johns-Manville, Box 290, New York 16, New York.

JM

**Johns-Manville**

**TRANCELL**

**an asbestos product for housing electrical equipment**


conducted in recent months by Hotpoint, Inc, to determine first hand reaction to water heaters in use and to the dealer's approach in selling them. The poll indicated that the reason for buying an electric water heater was predominantly the desire for a better and more convenient method of heating water. Only 21% of the buyers were influenced by features. Of this group, 11% cited appearance, style, size, and construction. Only 5% indicated that design of the heating element or heating unit influenced their purchase. About 1% named an adjustable temperature control.

• General Electric appliance dealers and distributor salesmen will have an opportunity to win expense-paid holidays in New York or San Francisco for their sales achievements during the period between September 1 and November 30. The trips will be awarded for best balanced sales performances. In order to qualify, distributors and retailers must accomplish a realization of quota on a majority of the company's major appliance lines.

• Celebrating its 75th anniversary, Gibson Refrigerator Co is presenting a "Diamond Jubilee" line of refrigerators, freezers, and ranges. All models have been re-styled and several new ones added. First presentation to distributors and dealers in New Orleans in October is being followed up with meetings in other key cities—New York, Chicago, and Las Vegas, Nevada.

• Claimed as a new concept in torchere lamp shades the "Vise-Grip" shade recently announced by Corning Glass Works features a tough, lightweight steel neck which makes the shade an integral part of the lamp itself. The lamp can be inverted and the grip of the steel springs in the neck will hold the shade in place. The steel neck also permits use of rugged pressed glass without excessive weight, which means less edge chipping and lower handling losses. The shade and steel neck are mechanically assembled in one piece at the factory.

• On October 5, 1951, Cory Corp, Chicago, produced its 10,000 commercial automatic coffee brewing system. Development was completed and volume production started on the device early in 1948. The unit automatically makes half gallon batches of freshly brewed coffee in three minutes at the touch of a button. It is piped to the water main whose pressure is used to force hot water through the coffee.

# "Light Conditioning" is high-spot of National Home Week exhibits!

## IN MINNEAPOLIS!

### Light Conditioning Used in 12 out of 18 NHW Homes

During National Home Week in Minneapolis, 18 homes were placed on display by Minneapolis builders. Of these, 12 were Light Conditioned.

### *Builder says Light Conditioning is Sales Advantage!*

Robert Bedney, prominent Minneapolis builder, says: "Light Conditioning brought out the real beauty and individuality of my National Home Week home—especially at night. From now on, I want my houses to be Light Conditioned all the way through. It is a real selling advantage."

### ELECTRIC SERVICE COMPANY PLAYS BIG ROLE

National Home Week — and Light Conditioning—were strongly promoted by Northern States Power Company, through radio, TV, give-away Light Conditioning booklets, window displays, and on-the-spot demonstrators in the homes.

## IN MILWAUKEE!

### Light Conditioning Draws Triple-Size Crowds

In Milwaukee, builders and the Wisconsin Electric Power Co., sponsored "Parade of Homes" during National Home Week. In one group of homes, three were Light Conditioned, seven were not. The Light Conditioned homes attracted an average of *three times* as many visitors as the normally-lighted homes.

### STOPS VISITORS!

A leading Milwaukee builder, Alfonse Zielinski, says: "I noticed that Light Conditioning stopped the visitors to our home. In past years, frankly, nobody even looked at the lighting. Light Conditioning, especially lighted valances, will certainly be in the plans for my future homes."

### *BUILDERS GET IDEAS!*

Among the most interested visitors to Light Conditioned homes were builders of *non*-Light Conditioned homes. After seeing Light Conditioning, many expressed intentions of Light Conditioning their homes in the future.

## IN DETROIT!

### LIGHT CONDITIONING MAKES FRONT PAGE

Highlighting the interest and importance of Light Conditioning, the Detroit Free Press featured the Light Conditioned Home on the front page of its special Sunday Home Week section.

### Builder and Electric Service Company are Light Conditioning Team

Both the Detroit Edison Company and Miller Homes Company promoted Light Conditioning during National Home Week in Detroit. Miller Homes ran a half-page ad featuring "Planned Lighting." Detroit Edison assisted in selecting lighting equipment, supplied demonstration personnel, distributed Light Conditioning recipe books.

### Recipe Book Cooks Up Sale!

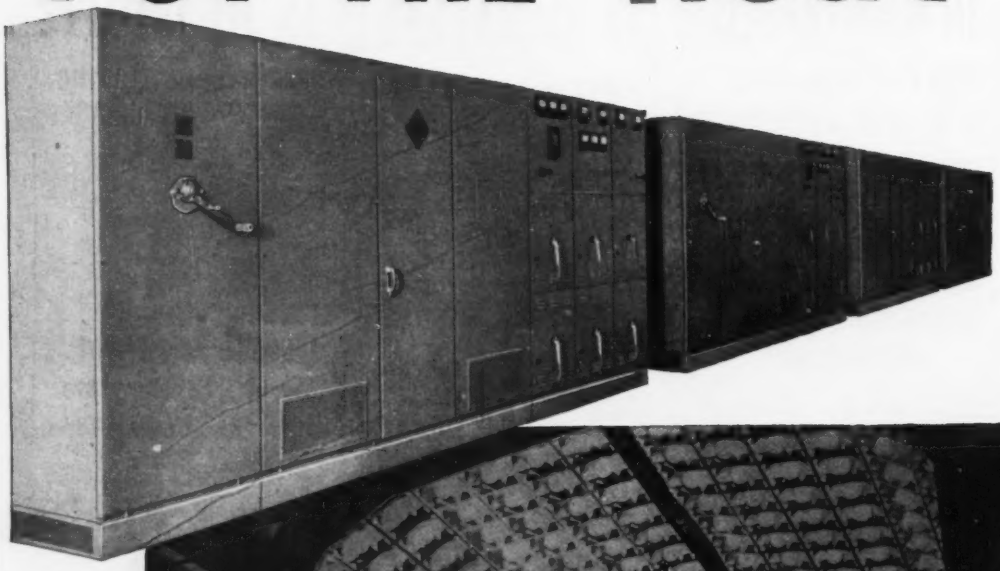
The supplier of the fixtures for Detroit's Light Conditioned home reports that a woman walked into his store with a copy of the Light Conditioning recipe book and asked for a duplicate set ($409 worth) of the fixtures she had seen in the demonstration home.

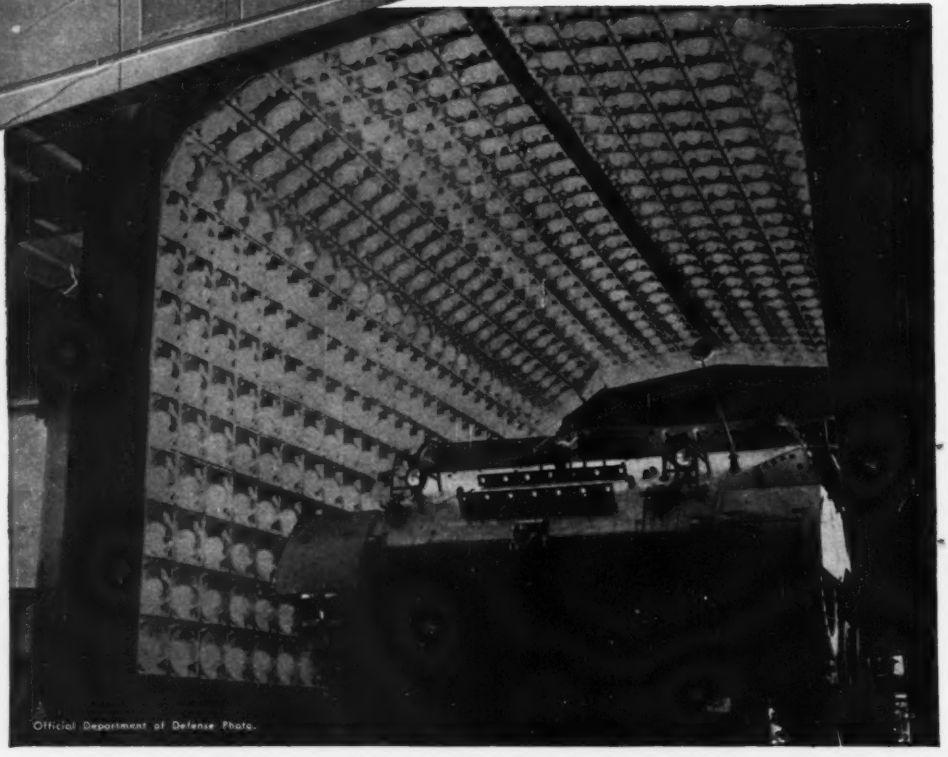
For help in promoting Light Conditioning in *your* community, write—
Lamp Division, General Electric Company, Nela Park, Cleveland 12, Ohio.

GENERAL ELECTRIC

## ALLIS-CHALMERS

# PUT THE "Heat"





Official Department of Defense Photo.

# UNIT SUBSTATIONS

# ON PRODUCTION!

YOU CAN INCREASE the production of your plant without adding production equipment or hiring more help . . . just eliminate undervoltage. Motors, lights, heating units—all electrical equipment gives top performance only when operated at full voltage.

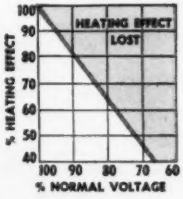
Paint baking or drying operations take longer when voltage drops. For example, a 10% drop reduces heating effect of infra-red lamps 19% . . . slows production. One paint drying operation required 63% more time when voltage dropped 10%.

A major cause of undervoltage is long, heavily loaded 480 volt feeders. Install Allis-Chalmers LCS Unit Substations at load centers and eliminate excessive line drop by shortening low voltage cables. Performance of all electrical equipment will improve . . . and personnel efficiency will increase because of better illumination from existing lighting fixtures.

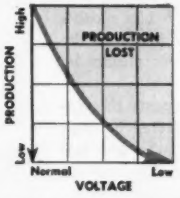
You can count on the cooperation of experienced Allis-Chalmers substation engineers in working out your distribution system. Allis-Chalmers LCS Load Center Unit Substations are neat, compact, easy to install and provide protection to personnel. Get in touch with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3372

ALLIS-CHALMERS
LCS
LOAD CENTER
Unit Substations

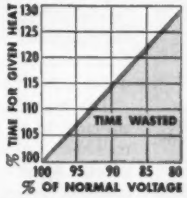
## HOW UNDERVOLTAGE WASTES MANHOURS . . . CUTS PRODUCTION



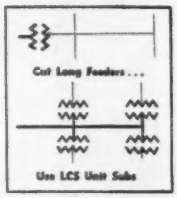

**FULL OUTPUT** from existing equipment demands full voltage. Heat output of infra-red lamps (used for baking paint on metal, drying coils of electrical apparatus and similar applications) drops with undervoltage. Output of resistance furnaces also drops off as the square of undervoltage.




**PRODUCTION LOSSES RESULT** from undervoltage. In one case a 10% drop in voltage cut the output of an infra-red drying oven from 1500 pounds per hour to 1275. Undervoltage means less work done each day . . . greater overhead for the work done, more manhours to be figured into every job.




**TIME IS WASTED** when undervoltage is distributed to infra-red bulbs and other heating devices. It takes longer to deliver the same amount of heat . . . longer to do a given job. In one plant, drying time for black painted sheet steel increased from 11 to 18 minutes by a 10% drop in voltage.




**A MAJOR CAUSE OF UNDERVOLTAGE** is voltage drop in secondary feeders. Long low voltage lines may prove inadequate as production schedules are stepped-up and new machines added. Install substations at load centers to cut feeder length, reduce voltage drop and increase production.

# ALLIS-CHALMERS

A-C ALLIS-CHALMERS

# NEW EQUIPMENT

## Capacitor Control Switch

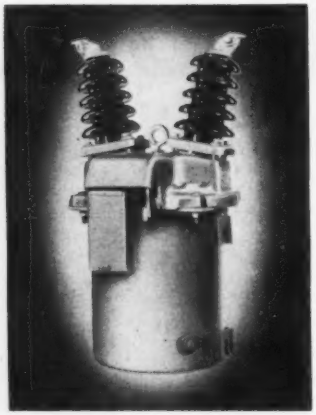
A new single-pole oil switch, the CSO-1 has been developed for control of small banks of pole-mounted capacitors.

The switch is reportedly well suited for sports field lighting, street lighting, airport lighting, and as a load break sectionalizing switch on rural and suburban distribution systems.

Switch can be operated manually, or electrically by an automatic control device. Operating coils are interchangeable and provide 110, 220 and 440 volt control.

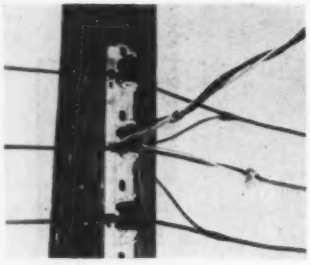
Single pole switches can be ganged mechanically or electrically for three-pole switching duty.

The switch has a reported life of 2,500 to 10,000 operations depending on the current switched. Its high momentary rating—6500 amperes rms asymmetrical—permits its use with large capacitor banks and banks in parallel on high capacity systems.



The CSO-1 has been designed for 15 kv and a thermal rating of 200 amperes. Current rating will vary with type of load.

**Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.**



## Aluminum Service Cable Dead-end

This preformed aluminum dead end is applied to the bare aluminum neutral of aluminum service entrance cable at both house and pole ends by a simple hand operation. No tools are required.

The strength of the completed assembly is reportedly more than twice the maximum expected loading for this type of cable.

**Preformed Line Products Co, 5349 St. Clair Ave, Cleveland 3, Ohio.**

## Fault Locator

A new testing and fault locating instrument reportedly enables electrical maintenance men to determine the exact location of faults or crosses by direct meter reading.

The manufacturer reports this instrument to be little affected by high resistance crosses or faults and unaffected by stray or parasitic currents invading ground connections.

A built-in ohmmeter permits resistance measurements from 0 to 2 megohms.

**R. F. Miller & Sons, Harvard, Neb.**

•

## Weed Killer

Known as CMU, short for 3- (p-chlorophenyl)-1, 1-dimethyl-urea, a new non-selective chemical weed killer reportedly "erases" dense growths of mixed grasses and broad-leaf weeds, leaving only an expanse of bare soil.

This product is reported to give excellent control of many perennial weeds such as Bermuda grass, quack grass, Johnson grass, and bindweed, as well as practically all annual weeds.

CMU appears to be absorbed into the root system of the plant, then moves up into the foilage. First effects are usually noticed from three to ten days after treatment, depending on the species sprayed.

Investigations are being made into the duration of soil sterility produced by CMU in various types of soils.

Potential commercial uses for CMU include prevention of growth of grass and weeds on railroad roadbeds and trestle locations, around substations, and manufacturing plant sites.

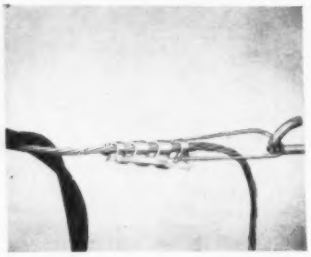
**E. I. DuPont de Nemours & Co, Wilmington, Del.**

•

## Dead-End Clamp

This clamp, designed specifically to dead-end the bare neutral type of self supported cable at either pole or service entrance, will accommodate wire sizes 6 solid through 4 stranded.

Clamp is constructed as a single unit. Serrated wedge grips the bare



wire with a force proportional to the strain put on it. Sag may be readjusted if necessary.

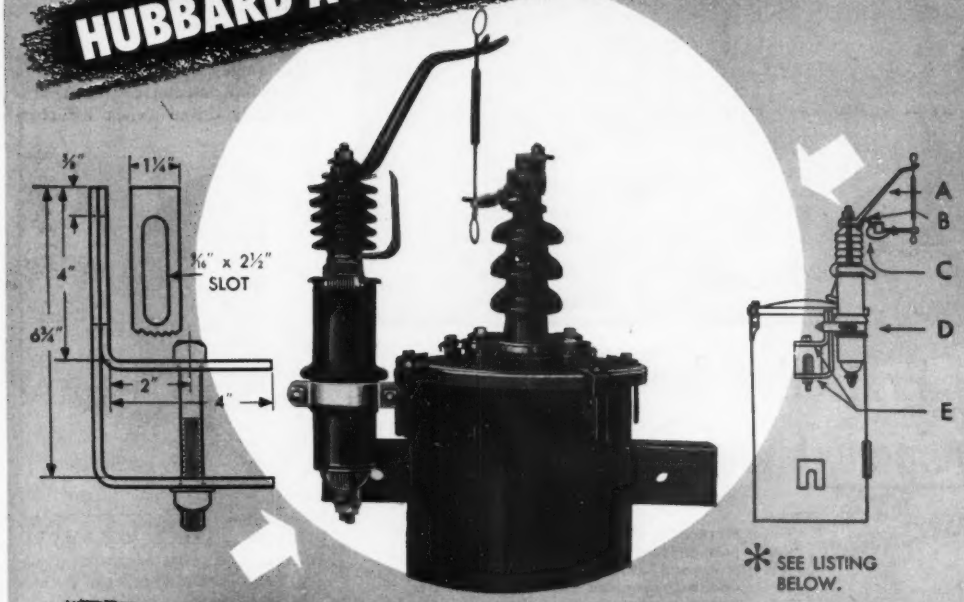
**James R. Kearney Corp, St. Louis, Mo.**

•

## Winding Insulation Tester

The redesign of its 10-kv winding tester for detecting insulation faults and winding dissymmetries in motors, generators, and coils, has been an-

# HUBBARD AUTOGAP FUSE KITS




# GIVE—COMPLETE PROTECTION

Hubbard Autogap Fuse Kits provide transformer protection with external accessibility. All parts are easily inspected. The fuse link is exposed, making it easy to select the right fuse for proper coordination. Transformer and kit can be assembled on the ground and mounted as a single unit. Kits for Vertical and Horizontal Autogaps are also available for factory assembly.

*

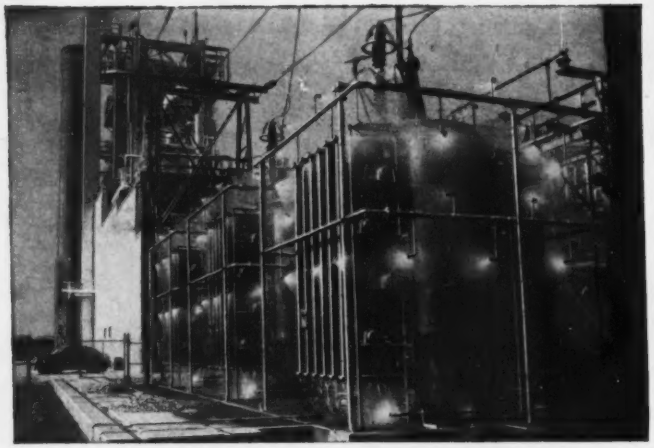
| | |
|---|---|
| A | *Bronze Fuse Fork* |
| B | *Terminal Lug Adapter* |
| C | *Chrome Steel Spring Assembly* |
| D | *No. 2332-9kv Autogap Arrester* |
| E | *Heavy Duty Adjustable Mounting Bracket No. 2349* |

**HUBBARD AND COMPANY**

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

*"Hang the Load on Hubbard Hardware!"*



# Protection for both your Equipment and your Customers

Financially, a transformer fire isn't so important, but the resulting black-out of power and light service to homes, hospitals, defense plants and municipal properties may well prove tragic. Protect your customers by protecting your transformers with a

*Deluge Systems, Wet Pipe Systems, Dry Pipe Systems, Water Spray and Fog Systems, Rate-of-Rise Sprinkler Systems, and Foam and Carbon Dioxide Extinguisher Systems.*

## BLAW-KNOX

### AUTOMATIC FOG SYSTEM

Through fast-acting rate-of-rise thermostats, any critically hot transformer is instantly blanketed with a heavy, quenching "fog" of water, confining the damage and protecting adjacent areas . . . materially reducing power failures in both frequency and extent. Without obligation Blaw-Knox engineers will survey your fire hazards, make a layout of the most efficient system and estimate costs. Blaw-Knox Fire Protection Systems carry the approval of all underwriters.

*Always on the Job!*

**BLAW-KNOX SPRINKLER DIVISION**
OF BLAW-KNOX CONSTRUCTION COMPANY
829 Beaver Ave., N.S., Pittsburgh 33, Pa.
Offices in Principal Cities

BLAW-KNOX AUTOMATIC FIRE PROTECTION SYSTEMS

nounced by the GE Special Products Division.

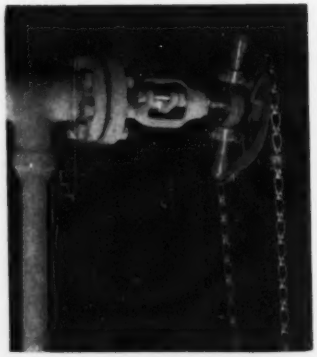
The main object of the tester is to detect insulation faults by stressing turn-to-turn and coil-to-coil insulation to higher values more conveniently than can be done by other methods.

The tester consists of a repeating type surge voltage generator, a cathode-ray oscillograph, and synchronously driven switch for alternately reversing the direction of surge travel through the winding.

Motors as large as 2000 hp, 2300 volts may be given adequate coil-to-coil and turn-to-turn test and the device may also be applied to miscellaneous small and medium sized coils and dc armatures up to 20 hp, 220 volts.

**General Electric Co, Schenectady**

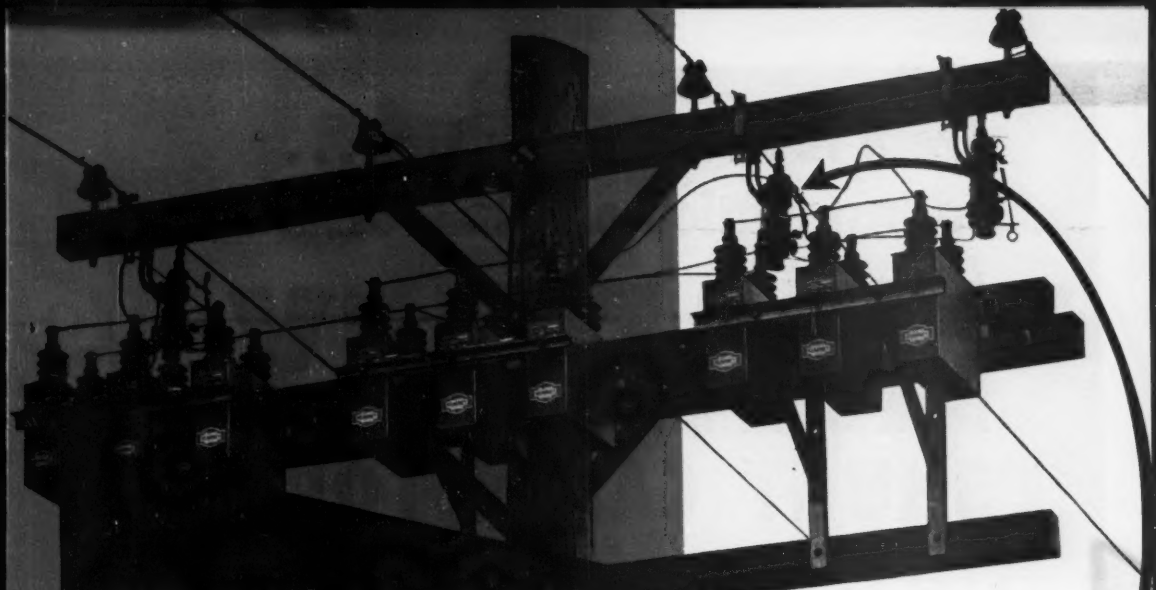
•



## Valve Handle

The problem of trying to close small valves tightly when they are located from 10 to 50 feet above floor level has reportedly been solved by the redesign of the Impactor Handle.

Designed so that the lugs on the



# When You're Faced with... Power Factor Correction or Voltage Improvement-

## CHOOSE KEARNEY SHUNT CAPACITORS

## *TO DO THE JOB!*

1. FIT ALL STANDARD MOUNTING RACKS
2. EXTRA HEAVY WET PROCESS PORCELAIN BUSHING
3. WELDED SHEET STEEL CASE WITH HOT ZINC SPRAY AND ENAMEL COATING

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue • St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario

## *PLUS A NEW SIMPLIFIED METHOD OF CONNECTION*

**AND KEARNEY'S EXCLUSIVE PROTECTIVE PACKAGING!**

Turn the page for more information on Kearney Shunt Capacitors

# From the Production Line... to Installation on the Crossarm

# KEARNEY SHUNT CAPACITORS

## are PROTECTED

It is vitally important that the Shunt Capacitor you install in your system has been carefully protected during shipping and storage.

Damaged bushing from careless handling can cause serious loss of vacuum — resulting in faulty operation of the capacitor.

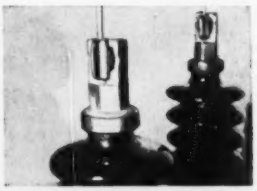
Kearney's Protective Packaging is the answer to this problem.

When Kearney Shunt Capacitors leave the factory, a protective wooden frame is firmly attached... to protect the capacitor from the hazards of shipping and installing. The corrugated shipping container, with convenient handholds, permits easy handling.

When you install a Kearney Shunt Capacitor, you can be sure it's ready for instant reliable performance.

### *NOW, EASIER INSTALLATION*

A simplified method of installation is incorporated in Kearney Shunt Capacitors. The lead or connecting wire can now be dropped in... replacing the old time-consuming method of threading. A time-saving device for the lineman.



## *Specify* KEARNEY PRODUCTS

AGAINST DAMAGE!
● Handholds in the carton are a practical convenience for storekeepers or linemen in handling capacitors.
● In or out of the carton, capacitor bushings are protected against damage. The entire weight of the capacitor is carried by the wood framing.
● Capacitors are raised by hand line through a welded lifting ring, with the wood frame intact.

*Write TODAY for complete information—specify Bulletin 21-1*

**JAMES R. KEARNEY CORPORATION**

4224-42 Clayton Ave • St. Louis 10, Mo. • *Canadian Plant:* Guelph, Ontario

JAMES R. KEARNEY ST. LOUIS, MO.

186

for BETTER CONSTRUCTION — SAFER MAINTENANCE through Constant Field Research and Engineering

**COLLYER SUPRENE**
**TYPE RR** provides the ideal combination of cable qualities: easy workability plus great durability. Suprene has a slick, lead-cured jacket of neoprene . . . easy to pull through ducts, easy to tap, easy to splice. This jacket is highly resistant to a wide range of operating conditions. It withstands sunlight, earth acids, oils, chemicals . . . gives great protection against abrasion, heat, flame, and moisture.

**Two types of insulating compounds are available: Heat Resisting Low Water Absorption (RH-RW) for 0 to 2000 volts; Oil Base—Ozone Resisting for higher voltages. Both compounds are formulated to assure dependable electrical stability in the presence of moisture.**

Collyer Suprene is offered in many sizes for many services. Use it for efficient power distribution on aerial, direct burial, conduit, and underground network systems. Use it once, and you'll see why so many major utilities have installed Suprene Cables. Write for samples and recommendations. Collyer Insulated Wire Co., 245 Roosevelt Ave., Pawtucket, Rhode Island.

**CHOOSE** *Collyer*


underside of the handle strike simultaneous blows against the lugs of an adapter securely attached to the valve stem this device delivers 2.8 times the force of conventional hand wheels.

Adaption of this device to small chain wheels reportedly gives operators the benefits of extra torque on a wide range of valve types.

**Edward Valves Inc, Chicago, Ill.**

•

## Soil-Resistivity Meter

Model 243-A Vibroground is a new, direct-reading meter for measurement of soil resistivities from 0 to 30,000 ohms per cubic centimeter.

Power is provided by eight standard No 2 flashlight cells.

**Associated Research Inc, 3760 W. Belmont Ave, Chicago 18, Ill.**

•

## Diesel Fuel Dehydrator

Increased combustion efficiency, reduced carbon formation, and reduced corrosion of working parts are claimed for internal combustion engines when using fuel dehydrated by this new unit.

Available in capacities of 350 and 600 gpm this unit has no moving parts.

Dehydration is accomplished by passing fuel through elements which are a combination of wound cellulose cylinders, coalescing media, perforated metal, and glass cloth.

**Bowser Inc, Fort Wayne, Ind.**

•

## Oscillograph Amplifier

Designed for use with Brush Magnetic Direct Writing Oscillographs the BL-962 provides a voltage gain of approximately 1000.

Frequency response is reported to be essentially linear from dc to 1000 cycles per second. A balancing potentiometer is provided for electrically biasing the oscillograph pen to any position on the chart.

**Brush Development Co, Instrument Division 26, 3405 Perkins Ave, Cleveland 14, Ohio.**

•

## Submersible Pump

Uses of this completely submersible utility pump include the many sumps found in boiler room pits, underground utility installations, elevator pits, and other low areas.

Pump is started automatically when

# New York Transformer Co. Insulates with IRVINGTON No. 100 Varnish

**"FOR EXCEPTIONAL LIFE IN SEVERE SERVICE"**

For specialty transformers that meet unusual and exacting requirements, the electronic industry turns to New York Transformer Co., Inc., Alpha, N. J. And for insulation that gives outstanding performance under the toughest conditions, NYT has turned—for more than 10 years—to Irvington No. 100 Clear Baking Varnish, for use on *all* its power transformers and chokes.

Here are two *major* reasons why NYT counts on Irvington No. 100:

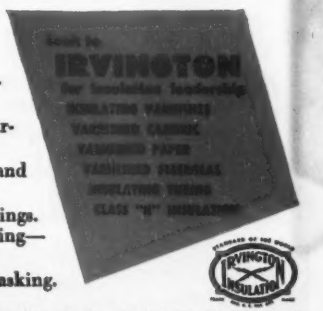
**MOISTURE RESISTANCE.** 24-hour water immersion reduces dry dielectric strength of 2250 vpm *by only 2.2%.*

**HEAT RESISTANCE.** Irvington No. 100 withstands ASTM heat endurance test at 105° to 110°C *for over 1000 hours.*

You too can give your products service advantages like these—and save time and money, *because . . .*

Irvington No. 100 cures fast and thoroughly, even in deep windings. Its clarity allows quick identification of color coding or numbering—saves time on the assembly line, reduces risk of rejects.

Get the full story today—Technical Data Sheet is yours for the asking.




EWO-11-51

***Send this convenient coupon now***

**Irvington**

**VARNISH & INSULATOR COMPANY**

**Irvington 11, New Jersey**

Plants: El Monte, California  Hamilton, Ontario, Canada

Irvington Varnish & Insulator Company
6C Argyle Terrace, Irvington 11, N. J.

Gentlemen:

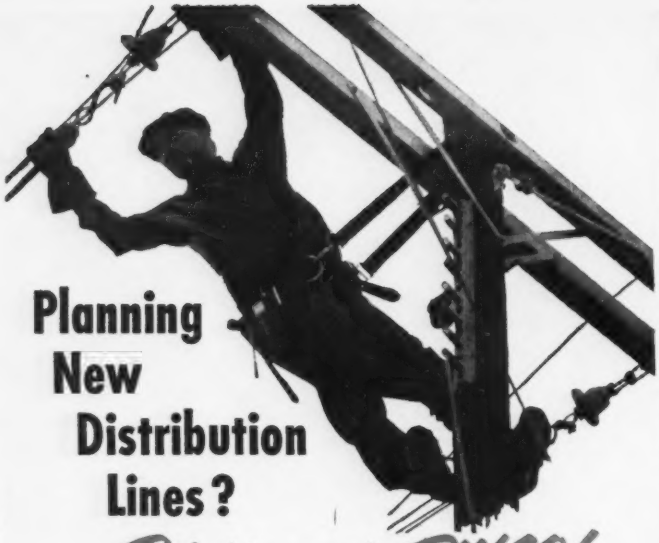
Please send me your Technical Data Sheet on Irvington No. 100 Clear Baking Varnish.

Name.....Title.....

Company.....

Street.....

City.....Zone.....State.....



# Planning New Distribution Lines?

## *Put it up to PINCO!*

Putting up a Distribution Line is no problem when you "Put it up to Pinco" . . . because Pinco has everything you need—Insulators . . . Line Hardware . . . Guy Strains. Pinco makes them all, and they're all "tops" in performance as thousands of miles of such lines can prove. Engineered and built to distribution line requirements, Pinco products are not only RIGHT *for* the Job but RIGHT *on* the Job . . . for You!

***Refer to Pinco Catalog No. 49 for complete electrical and mechanical characteristics.***

No. L4038

Pinco Strain or Dead-End Clamps

No. L1921

No. L4550

Pinco Guy Strains

Nos. L289
L506
L504
L502

No. L63

Pinco Pin Type

No. L223

Pinco Pin Type

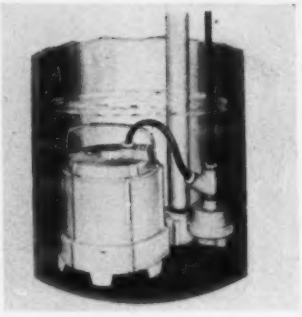
No. L1510

Pinco Suspension Type

The Porcelain Insulator Corporation
761 Main St., Lima, N. Y.
Sales Agents: JOSLYN MFG. & SUPPLY CO.
Offices in Principal Cities

PINCO INSULATORS

Suspension Insulators . . . Switch and Bus Insulators . . . Distribution Clamps . . . Distribution Pin Types and Guy Strains . . . Transmission Line Fittings . . . Tree Insulators . . . Transformer and Circuit Breaker Bushings . . . One Piece and Multi-part High Voltage Pin Types . . . Suspension and Strain Clamps . . . Indoor Bus Support Porcelain . . . Lightning Arrester Porcelain.

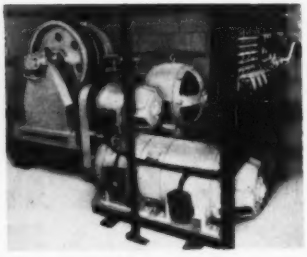



air pressure created by water rising in the control switch skirt trips switch.

Capacity is 3,300 gallons per hour.

**Kenco Inc, 1125 North Ridge Road, Lorain, Ohio**

•



## Elevator Motor Drives

DC variable-voltage drives, two-speed, and single-speed ac drives for passengers and freight elevators are now being manufactured by the Electro Dynamic Division.

Typical variable-voltage installation shows MG set with belted exciter and dc sleeve bearing elevator hoisting motor.

**Electric Boat Co, Bayonne, N. J.**

•

## Electric Lawn Mower

Whirling action of the Sensation Model 22E cuts a 22 in. swath—chopping grass clippings so fine that

# ELIMINATE MOTOR FAILURE with class (H) insulation made with DOW CORNING SILICONES

## Wet Motors

are a constant threat to your production schedules . . . unless they're wound with Dow Corning Silicone (Class H) insulation. Here's evidence of the fact that Class H has at least 10 times the wet insulation resistance of the next best class of insulating materials. At Virginia-Carolina Chemical Corporation's Homewood mine, a 300 hp., silicone insulated motor was back in service 3 hours after flooding with mud and waste water. Under the same conditions, an identical Class B motor had to be reworked and rebaked. Similar experience over the past 5 years has persuaded many chemical companies to specify Class H exclusively for all condensate and centrifugal pump motors.

## Hot Motors

die young . . . unless they're protected with Dow Corning Silicone (Class H) insulation. Here's evidence of the fact that Class H insulation makes hot and hard working motors last 10 times longer than they ever did before. Silicone insulated spinner bucket motors in rayon mills last 6 to 24 times as long as Class A motors. Silicone insulation makes the high speed, rapidly reversing motors used by Cogsdill Twist Drill Company last 12 to 100 times as long as Class A or Class B motors. In a large steel mill, a crane hoist motor had 4 to 42 times the life of a Class B motor.

## Note to electrical Design Engineers

There's a rapidly growing industrial and military demand for Class H equipment . . . the only kind that can withstand the toughest operating conditions. Write for Catalog No. AY-11 listing Class H insulation components and specifications.

**DOW CORNING CORPORATION, MIDLAND, MICHIGAN**

FIRST IN SILICONES

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • LOS ANGELES • NEW YORK • WASHINGTON, D. C.

In CANADA: Fiberglas Canada, Ltd., Toronto • In GREAT BRITAIN: Midland Silicones, Ltd.

**Cable Spinning in Field with Neale Model "K"**

1. One-third LOWER INSTALLATION COST than with pre-assembled cables.
2. SAVES SPACE over open-wire construction in congested areas.
3. Provides EXTRA PROTECTION against storm damage.
4. Light weight single conductor cables can be handled in 300% GREATER LENGTHS than heavy pre-assembled cable. Reduces number of splices and installation labor costs.
5. REDUCES CABLE INVENTORY, as 1/c, 2/c or 3/c cables may be made up in the field as required. Invaluable in emergencies.

NEALE MODEL "K" SPINNER spins a single cable, or three 2" cables into a compact triangular pattern. Apex of triangle points down. Strand lies in groove formed by two top cables.

Drum rotated by two friction drive wheels which are rotated by wire being pulled from drum. Regardless of condition of strand, drum revolves once when 13" of wire is pulled. Drum carries two spools of spinning wire spaced to spiral 6½ inches apart for ample cable support.

Magnesium castings used wherever possible for lightness and strength. Weight approx. 36 lbs. Length 18½", 12" diameter, 4¾" exit.

NEALE Spinning Wires available in seven different types and sizes.

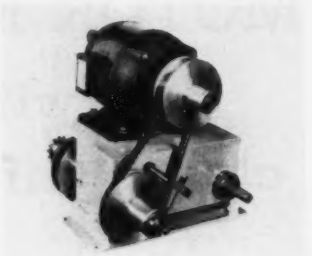
CABLE SPINNING EQUIPMENT CO.
TOPEKA, KANSAS Phone 3-1829


no raking is required when grass is cut at regular intervals.

Mower is powered by a ½ hp electric motor.

**Sensation Mower Inc, Ralston, Neb.**

•



## Variable Speed Drive

Accuracy of regulation with no hunting and a nearly complete absence of drifting reportedly holds speed variation of this compound V-belt drive to less than ¼ of 1% throughout the entire speed range.

Capacities ranging from ½ hp to 10 hp with ratios up to 50:1 with speed ranges from 150 to 7500 rpm are available.

**Speed Selector Inc, Cleveland, Ohio**

**MORE NEW EQUIPMENT**

**Just Received**

**Appearing Next Issue**

**SURGE COMPARISON TESTER**
Locates insulation faults and winding dissymmetries in motors, generators, transformers, and coils

**POTENTIOMETER CIRCUIT**
Permits measurements of spans as narrow as 100 microvolts

**INDUSTRIAL TV CAMERA TUBE**
Small size permits observation at inaccessible or hazardous locations

## Climate-Survey System

Drag-free anemometer characteristics and electronic data techniques are combined to provide accurate recordings of wind direction and wind speeds from a threshold below one to 30 mph.

Speed and direction recordings are made on separate standard pen-type 0 to 1 milliammeters. Two speed ranges are provided: 0 to 10 and 0 to 30 mph.

The system is suggested for use in smog surveys, river flood forecasting, and investigations of light winds which have major influence on the build-up

# NEW BULLETIN

## Describes Newest BIG Fairbanks-Morse Diesel Dual Fuel Engine!

## *Send for Your Copy!*

Here is complete, up-to-date and authoritative information on the newest Diesel Dual Fuel engines in the 3500 hp. class! A valuable reference, it covers the advanced design features you'll find in the new Fairbanks-Morse Model 31A18 Oil Diesel and Dual Fuel engines. With cross-sections and descriptive diagrams, it covers in detail the design and operation of these heavy duty engines, including complete descriptions of Dual Fuel operations—showing how the Model 31A18 Oil Diesel engine may be economically changed to a Dual Fuel engine by merely installing simple accessory equipment. Power station owners and operators interested in low operating and maintenance cost, automatic safety control, simplicity of design and operation—and complete dependability with high efficiency—should have this book for their files. Use the coupon to get your copy.

**FAIRBANKS-MORSE,**

***a name worth remembering***

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • RAIL CARS • MAGNETOS • FARM MACHINERY

### TO LEARN MORE ABOUT THESE MODEL 31A18 FEATURES...

**En bloc construction** ... for greater rigidity and correct alignment ...

**Removable cylinder liners** ... with integrally cast leakproof waterjacket ...

**Dome-shaped cylinder heads** ... for improved combustion and cooling ...

**Improved connecting rod design** ... pistons and rods may be removed without disturbing crankpin bearings ...

**Oil-cooled pistons** ... for longer piston ring and liner life ...

**Simple controls** ... start or stop by the movement of a single lever. Hydraulic governor speed control ...

*Use this Coupon!*

Fairbanks, Morse & Co.,
600 South Michigan Ave.,
Chicago 5, Illinois

Send me a copy of the new bulletin on the Model 31A18 Oil Diesel and Dual Fuel engine.

Name_____

Position_____

Address_____

City_____ State_____

# On mile after mile of Chicago streets it's AMPLEX STREET LIGHTING LAMPS!

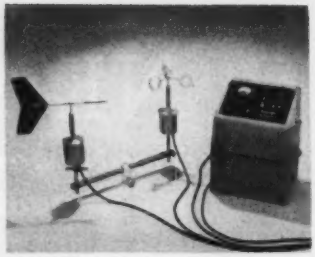
FAR SUPERIOR LIGHTING! Dollar savings never before obtained! That's why more and more American municipalities and public utilities are adopting Amplex Street Lighting Lamps. These lamps are specially designed and built to resist the incessant shocks and jars of traffic . . . to retain the highest degree of light output during the whole of their long-burning life.

Amplex Street Lighting Lamps are made in the most complete line ever marketed . . . give you the right type and wattage for every purpose. And rapidly winning today's leadership are Amplex Weatherproof Lamps formed of "hard glass". Records prove that Weatherproofs virtually abolish failures that are caused by climatic conditions . . . establish completely new standards of dependability and service economy.

For full facts about Amplex Street Lighting Lamps and their outstanding performance, contact Amplex Corporation, Dept. J-11, 111 Water Street, Brooklyn 1, New York.

AMPLEX

Sealed-Beam Reflector Lamps, Colorbeam Lamps, Spotlites and Floodlites, Industrial Infra-Red Heat Lamps, Vibration and Rough Service Lamps, Street Lighting Lamps, Traffic Signal Lamps, Incandescent Lamps, Fluorescent Tubes, Display Accessories.

of effluents from smokestacks and other sources of industrial atmospheric contamination.

**Beckman & Whitley Inc, 912 San Carlos Ave, San Carlos, Cal.**

•

## Fluorescent Sign Lamp

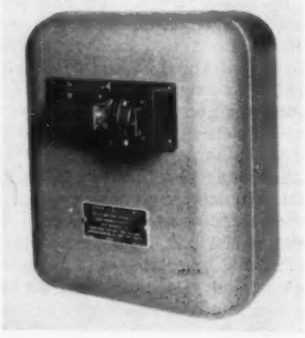
Operating much as a standard fluorescent lamp the Durolier fluoresces an advertisers message in brilliant colors.

A number of colors may be combined in one design.

Unit is operated at standard voltages from any convenient outlet.

**Duro-Test Corp, North Bergen, N. J.**

•

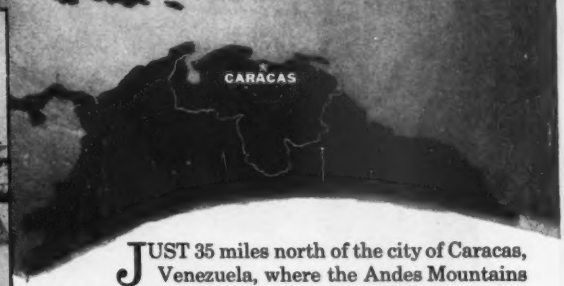


## Impulse Counter

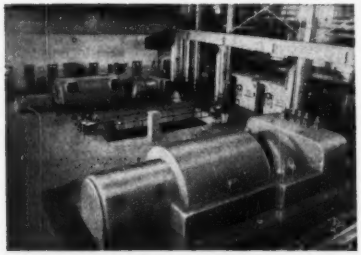
Designed to cover counting ranges above those possible with electromechanical counters and below those in which scalers are normally re-

# More Power to South America

## from Pritchard



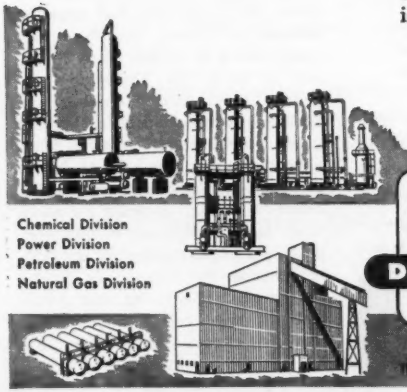

JUST 35 miles north of the city of Caracas, Venezuela, where the Andes Mountains rise from the Carribean, a new, modern building is nestled in a small valley on the seacoast. This building contains a *40,000 kilowatt* steam electric power station which ties into the distribution system serving the industrial and residential needs of the Federal District of Venezuela.



Interior of the 40,000 kw. steam electric power station designed and built by J. F. Pritchard & Co. near Caracas, Venezuela.

Designed, engineered and constructed by Pritchard, the Arrecifes Power Station of C. A., La Electricidad de Caracas, has boilers, turbines and all auxiliary equipment arranged for unit system operation without cross connection. This installation is another fine example of the many outstanding Pritchard-built plants that are providing maximum efficiency at lowest cost.

Whether *your* need is for a complete new plant, alterations or expansion, Pritchard provides the sound design, engineering and construction services that pay off in operational efficiency and trouble-free service. Your inquiry is invited.



Chemical Division
Power Division
Petroleum Division
Natural Gas Division

*For Complete Information, Write*

NATIONAL CONSTRUCTORS ASSOCIATION — MEMBER

**J.F. Pritchard & Co.**

**DESIGN · ENGINEERING · CONSTRUCTION**

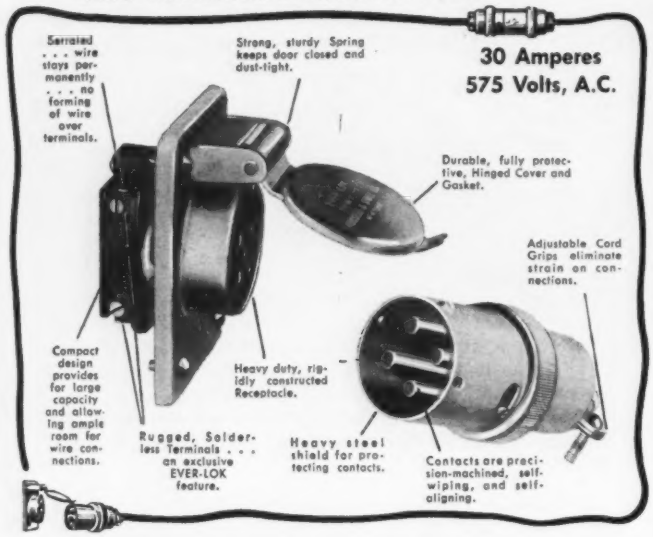
Dept. No. 209 — 908 Grand Ave., Kansas City 6, Mo.

District Offices: CHICAGO · HOUSTON · NEW YORK · PITTSBURGH

# EVER-LOK®

## RECEPTACLES, PLUGS AND CORD CONNECTORS

...FOR HEAVY-DUTY UTILITY AND INDUSTRIAL APPLICATIONS


Serrated . . . wire stays permanently . . . no forming of wire over terminals.
Strong, sturdy Spring keeps door closed and dust-tight.
30 Amperes
575 Volts, A.C.
Durable, fully protective, Hinged Cover and Gasket.
Adjustable Cord Grips eliminate strain on connections.
Compact design provides for large capacity and allowing ample room for wire connections.
Heavy duty, rigidly constructed Receptacle.
Rugged, Solderless Terminals . . . an exclusive EVER-LOK feature.
Heavy steel shield for protecting contacts.
Contacts are precision-machined, self-wiping, and self-aligning.

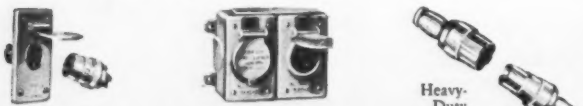
R&S Ever-Lok heavy-duty plugs and receptacles carry full-rated load currents safely and with the greatest of ease under severe operating conditions. Industry and Utilities specify these rugged cord connectors because Ever-Lok has the right combination of features for heavy-duty service applications.

Outstanding Ever-Lok advantage is an automatic locking grip that prevents faulty contacts and accidental disconnection in service. Every Ever-Lok plug grips fast and holds forever despite every tug or pull—yet separates instantly with a finger-tip twist of the powerful bayonet type lock.

Good products need good connections—and Ever-Lok always provides a happy ending to cord connector problems.

*Write for Literature E.L.-*

• R&S Ever-Lok complete lines are available from Midget type 10 amperes to 200 amperes heavy service types . . . standard or reverse service . . . fused and non-fused types.




EL446-20

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N.Y.

RUSSELL & STOLL


quired this device provides one hundred per cent accuracy up to 60 counts per second.

Counter consists of a step motor with a resetting type register, and power supply.

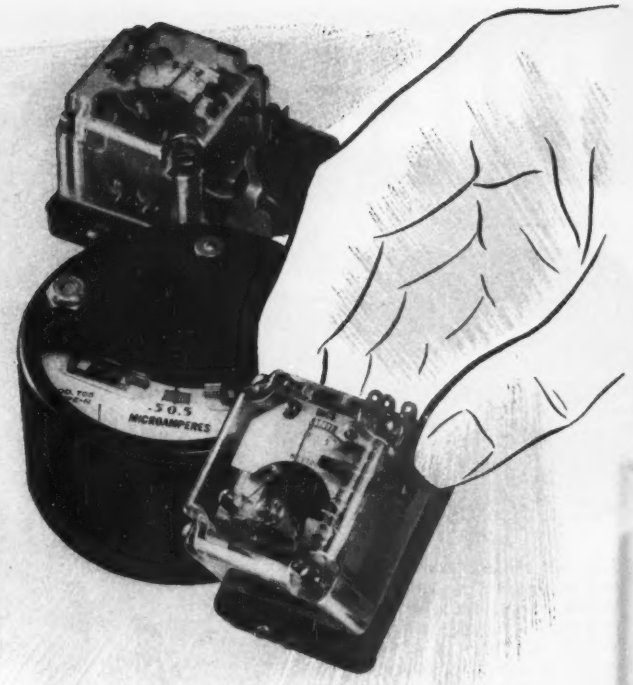
**General Electric Co, Schenectady**

## MORE NEW PRODUCTS about which you should know

Haydon Mfg Co, Inc, Torrington, Conn., has developed a **new 400 cycle timing motor.** This hysteresis type synchronous timing motor requires no RF filtering or shielding. Altitude effect is eliminated and brush life prolonged. . . . LML Engineering and Mfg Corp, Columbia City, Indiana, announces new Cardinal **infrared brooder.** Made of rust-resistant metal it has horizontal diameter of 15 in. Four 250-w R-40 lamps set at an angle give infrared rays an area spread wide enough to brood flock of 300 to 400 chicks.

Garden City Plating and Mfg Co, Chicago 22, Ill., announces new **fluorescent fixture** for use over inspection and assembly benches. Available in 4- and 8-ft lengths, with one 40-w T-12 lamp per 4-ft length. Parabolic reflector of Alzak aluminum provides high levels of even light over entire working area. . . . Hombro Machinery Div, 350 Fifth Ave, New York, has introduced new line of Wrigley **material handling equipment.** Included is low price 8½ ft by 3 1/3 ft truck powered by 3-hp gasoline motor.

The Borg Corp, Watertown 72, Mass., has added new **unit vibration isolators** to existing line. New load ranges are 8 to 16 lbs, 14 to 25 lbs, and 22 to 35 lbs. Units are "ruggedized" to withstand severe shock and are claimed to be unaffected by very extreme temperature. . . . Johns Manville, 22 E 40 St, New York 16, N. Y., announces **new automatic ring packing** called "Uneepac," designed for maximum sealing efficiency in minimum packing depth so stuffing box sizes can be reduced. No follower or header rings needed, thus saving time. Available in varied compositions to suit different services—water, steam, oil, air, gas, vacuum, etc.




# Boost feeble input signals with Sensitrol® ultra-sensitive relays

How many devices do *you* know of that use an amplifier to boost a feeble input signal up to where it will operate a relay? Most of them would be more reliable . . . more compact . . . more economical—if the amplifier could be omitted.

It can be omitted! For rugged Weston Sensitrol Relays operate reliably on input signals as slight as *1 millivolt* or *½ microampere*, handle substantial wattage *at 110 volts!* They require no power for excitation.

Engineering assistance is freely offered to help you adapt these Sensitrol Relays to present products, or any new problems you may have in mind. Simply consult your nearest Weston Representative, or write Weston Electrical Instrument Corporation, 594 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAGliabue instruments.

## *A Type for Every Need*

So sensitive that they operate direct on the output of a photo-electric cell or thermocouple, Sensitrol relays enable the instrument engineer to dispense with amplifiers, vacuum tubes and auxiliary power supplies. Single or double contacts, fixed or adjustable; manual or solenoid reset. Be sure you have a copy of Bulletin B-25-B, which gives detailed data on Sensitrol and other Weston relays.

# WESTON *Instruments*

# PULL *and* POWER

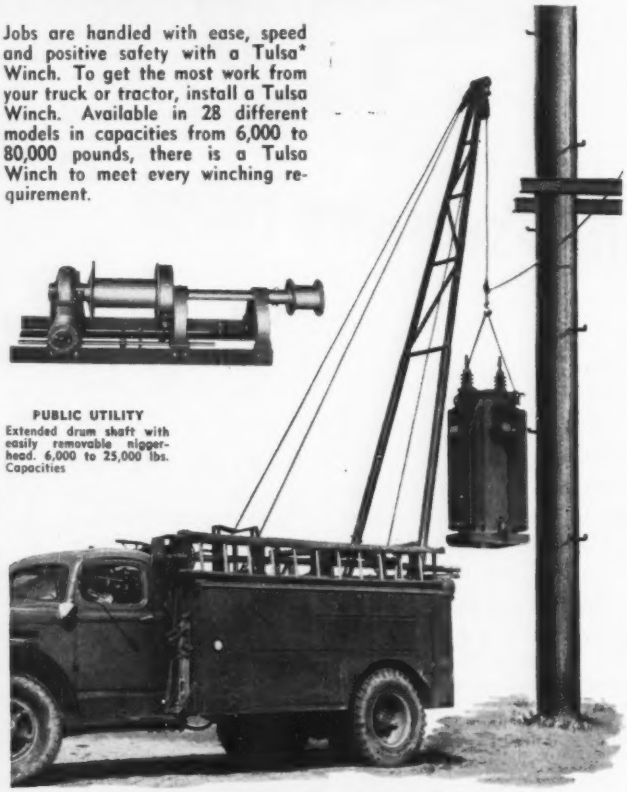
Tulsa Winch models for all trucks from ½-ton up.

Tulsa Winches for all crawler tractors complete with transmission, line roller assembly and mounting brackets ready for installation.

Jobs are handled with ease, speed and positive safety with a Tulsa* Winch. To get the most work from your truck or tractor, install a Tulsa Winch. Available in 28 different models in capacities from 6,000 to 80,000 pounds, there is a Tulsa Winch to meet every winching requirement.



**PUBLIC UTILITY**
Extended drum shaft with easily removable niggerhead. 6,000 to 25,000 lbs. Capacities



*Reg. U. S. Pat. Off.

Tulsa* Winch
TULSA, OKLAHOMA
DIVISION OF VICKERS Inc.

815-49 E. First Street


## WHAT THEY'RE SAYING
### at industry meetings

### Adequate Wiring and the Electrical Contractor

Fred Sudduth, *Contractor and Appliance Dealer, Marshall, Texas, at the conference of the International Association of Electrical Leagues, New Orleans, La.*

I suggest that the very first step to get desired cooperation is to get off the high pedestal from which you look down on the lowly contractor, roll up your sleeves and open your mind to some plain and simple facts of doing business. We contractors, in talking among ourselves ask: "How can we get the cooperation of our suppliers in this adequate wiring program?" or, "Why can't we get the cooperation of the utilities?" and these are not fictitious questions either. Cooperation in adequate wiring goes much deeper than merely beating the drums for and paying lip service to it.

### Electric Power Outlook

B. B. Parker, *chief, Minor Requirements Branch, DEPA before Illinois Public Power Assoc annual meeting at Peoria, Ill.*

The electric power outlook for 1952 and 1953 is more serious than at any other time in our history. The reserve power margins of 20 percent at the end of World War II had decreased to 6 percent by 1950, hardly enough to take care of units out of service for repairs or routine inspections.

Present plans call for adding 27 million kw capacity during 1951 to 1953. This is a 10 million kw increase over the 1950 estimates for power expansions, and the increase is to meet defense requirements.

About 8 million kw will be added in 1951 as originally scheduled. Cutbacks in third and fourth quarter material requirements plus inability to fill orders for full amount of allotments will cause a deficiency of 1.5 million kw by the end of 1952.

If the 1952 allotments follow the trends of the last quarter of 1951, generating installations for 1953 would be reduced 2.5 million kw, resulting in a shortage by the end of 1953 of approximately 4 million kw.

Order board schedules of electric generators and related equipment have

slipped from one to three months, further aggravating the situation.

The 1951 electric load and peak demands are about 12½ percent higher than in 1950. Normal average increase is about seven percent. It is expected that 13 billion kwhr will be needed for aluminum production in 1952 from public utility supplies. To meet these demands, the power program must be completed as scheduled.

The transmission and distribution material requirements are just as critical. Copper is critically short. However, aluminum supplies are increasing, and the electric industry is expecting 10 to 20 percent more aluminum in the third and fourth quarters of 1952. This means operations should be adapted to accept and use either copper or aluminum, whichever is more available at the time.

Distribution and power transformers, electric meters, and other manufactured items will be in short supply.

Nickel is in short supply already. Stainless steel hardware will not be available. Wood should be substituted for steel, and galvanized static wire for copper and copperweld. Materials must be conserved at all cost to keep the power expansion program going.

### Wasting National Wealth

H. P. Liversidge, *chairman Philadelphia Electric Co before the Philadelphia Rotary Club at an Invest in America luncheon*

The American people should rise up and halt the upward trend of taxes. The US has been destroying as well as giving away a large part of its national wealth, and in amounts far exceeding anything in the past. The immediate result of this waste is higher taxes and the end result confiscation of private wealth.

The cost of multiple government agencies adds up to taxes that are destroying incentive and sapping our ability to produce new wealth.

The people as a whole must be made to realize that investors have provided and continue to provide more and better tools for workers, so they can manufacture more products, quicker, cheaper and in greater variety. The electric utility industry requires an investment of $62,000 per worker, which is the largest of any industry, and nine times as much as for manufacturing as a whole.

Chief Engineer Upchurch (right) gives message to operator for general broadcast to all game wardens via Arkansas's RCA Microwave relay and 2-way radio system.

Twenty-five miles of costly pole-line construction, easements, and maintenance were eliminated by an RCA microwave link in the 2-way radio system recently set up by the Arkansas Game and Fish Commission.

Radio signals are beamed from capitol dome 15 air miles by RCA Microwave to a transmitter and relay station atop Chenault Mountain. From here state-wide FM 2-way radio contact is maintained with several outlying fixed stations and with 175 mobile stations in autos, trucks, and jeeps of far-ranging game wardens . . . *all at a saving of $36,500 and with no pole-line maintenance.*

**Are you missing a bet on RCA Microwave?** Do *you* have a problem maintaining communications through wind, sleet, and falling trees? RCA Microwave is the answer. Eliminates pole lines, easements, line maintenance, storm outages. Costs less per mile for comparable capacity. Signals travel by radio beam, span up to 35 miles. Repeater stations relay signal over mountains and valleys, operate unattended for months. System has channels for voice, supervisory control, teleprinter, 2-way radio, other circuits. So *dependable* it's used by telegraph and power companies, highway commissions, others. Get full story. Mail coupon . . . *today!*

RCA ENGINEERING PRODUCTS
Dept. 45-WB, Camden, New Jersey

Please send me, without obligation, full story on how new RCA Microwave can give efficient, all-weather communications without pole lines, easements, or line maintenance.

Name_____

Title_____

Firm_____

Address_____

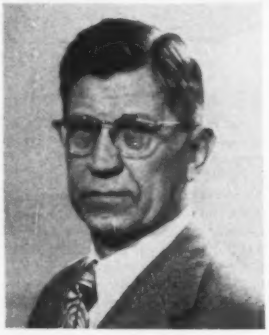
RCA RADIO CORPORATION of AMERICA

# NEWS ABOUT PEOPLE

## West Penn Power Moves Up Restofski, Skooglund

Harry Restofski, former general sales manager of West Penn Power Co, has been elected a vice president of the utility. The company also named Carl M. Skooglund chief electrical engineer to replace H. A. P. Langstaff who has retired.

HARRY RESTOFSKI



C. M. SKOOGLUND

In other appointments the company named William C. Bowen senior electrical engineer and Harrell Denmead electrical operating engineer.

Restofski, who became sales manager in 1948, started to work for West Penn Power in 1914. He served successively as asssistant to the vice president in charge of the power department, general safety director, an assistant to the president, assistant general manager of the West Penn Appliance Co, training director, personnel director, sales promotion manager, and general sales manager.

Skooglund, who has been electrical engineer of power stations and substations, joined West Penn in 1921 as an assistant engineer. In his new capacity he will be responsible for the electrical engineering—including consultation, studies, design, and equipment application—of all power stations and substations in the system.

Starting with West Penn as a relay engineer in 1920, Langstaff for several years was responsible for application, checking, design, ordering, and maintenance of relays, meters, and oil circuit breakers. He was promoted to chief electrical engineer in 1949.

•

**Edward F. Ziegler** has been appointed assistant vice president for labor relations of New England Electric System companies. He has been associated with NEES companies in supervisory and executive capacities since 1929. In addition to his new duties, Ziegler will continue to serve in an advisory capacity to NEES companies in Lowell, Lawrence, Haverhill and Amesbury, Mass.

**Al Ormston** has been appointed assistant chief mechanical engineer of Florida Power Corp. He joined the company in 1939.

**Daniel J. O'Neill,** local representative at Johnson City, N. Y., for New York State Electric & Gas Corp, has been appointed manager of residential and commercial sales for the Binghamton Division of the utility.

**C. B. Shell,** general foreman of electrical construction for the Youngstown Division of Ohio Edison Co, has been appointed superintendent of substations for the Akron Division. The utility also named **John P. Baker** to the newly created post of coordinator of personnel relations for the Lake Erie Division. He has been service supervisor at Lorain.

## Osborne and Turner Get New Westinghouse Duties

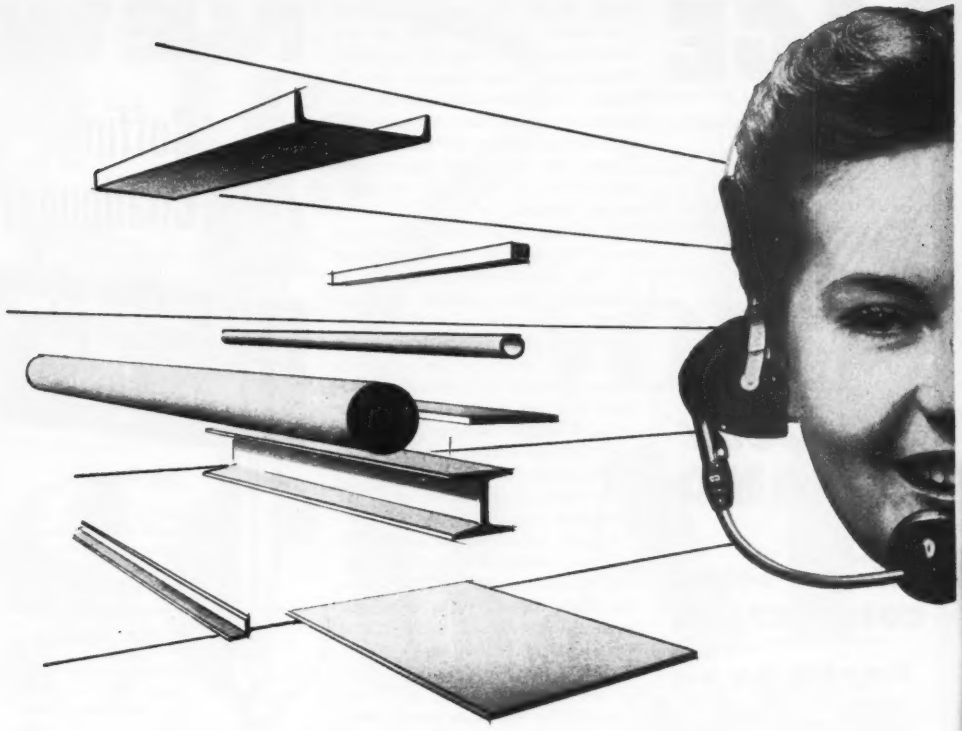
Westinghouse Electric Corp has assigned new duties to two of its vice presidents in a move to expedite the company's defense activities.

L. E. Osborne, formerly vice president in charge of manufacturing, has been named to the newly created post of executive vice president in charge of defense products. Tom Turner, vice president in charge of labor relations, has been given, in addition, the manufacturing responsibilities which have been held by Osborne. Turner's new title is vice president in charge of manufacturing and labor relations.

L. E. OSBORNE

TOM TURNER

Osborne, who joined Westinghouse at the age of 16 as a clerk in the tool room of the company's East Pitts-



# STEEL

## for Suppliers of Power and Light

Contact us for all your steel requirements and extend Defense Order Ratings where they apply. Despite current shortages we will do our very best to supply you. And when we have the steel you are assured of prompt, personal service.

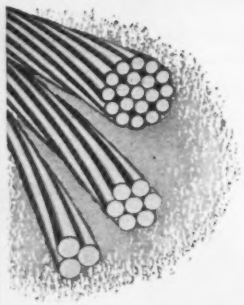
**PRINCIPAL PRODUCTS**

**CARBON STEEL BARS**—Hot rolled and cold finished
**STRUCTURALS**—Channels, angles, beams, etc.
**PLATES**—Many types including Inland 4-Way Safety Plate
**SHEETS**—Hot and cold rolled, many types and coatings
**TUBING**—Seamless and welded, mechanical and boiler tubes
**ALLOYS**—Hot rolled, cold finished, heat treated. Also tool steel
**STAINLESS**—Allegheny bars, plates, sheets, tubes, etc.
**BABBITT**—Five grades, also Ryertex plastic bearings
**MACHINERY & TOOLS**—For metal fabrication

# *Call* RYERSON

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

# PAGE



*Stainless Steel*
**STRAND**
**AND**
*Stainless-Copper*
**CONDUCTORS**

**Here's WHY they Save**

Compared with other types strand of equal breaking strength, they . . .

- have 30-40% greater overload capacity within elastic limit.
- resist corrosion all the way through—not merely through a thin case of soft metal.
- offer highest tensile and vibration-fatigue strength (tensile strength 235,000 psi; corrosion-fatigue limit 50% of ultimate).

**Here's HOW they Save**

- They permit longer spans—therefore require fewer poles per mile.
- Being lighter, they are easier and faster to install in the field.
- More resistant to destructive factors, they last many times as long before replacement.

*Let us tell you the whole story—*

specific data, prices, recommended sizes.

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE


burgh Works, has been a vice president since 1942. In 1946 he was named senior operating vice president. Three years later Osborne was assigned staff supervision over all the company's manufacturing activities, including production and industrial relations. He retained his operating responsibility for five major manufacturing divisions.

In his earlier assignments Osborne served the company as works manager for the merchandising division at Springfield, Mass., manager of manufacturing and engineering of the merchandising division, assistant to the president in charge of the company's national defense subcontracting program, manager of the steam division at the South Philadelphia works. In 1941 Osborne worked with the Office of Production Management as chief of the heavy ordnance section in the production division.

Turner joined Westinghouse in 1922 as a machinist at the East Pittsburgh Works. He later worked in the time study department at East Pittsburgh and in 1932 was transferred to Newark, N. J., to do similar work. Turner became superintendent of the Newark Works two years later.

In 1948 he was made general manager of the company's elevator division at Jersey City, N. J., and in 1950 was elected a vice president. Shortly after becoming a vice president, Turner was placed in charge of plant labor relations.

•

**LeGrand Cannon,** division sales manager at Dixon, Ill., for Public Service Co of Northern Illinois, has been named staff assistant to the vice president in charge of sales of Commonwealth Edison Co, parent of Public Service.

**Louis D. McDowell,** manager of Consumers Power Co's office at Adrian, Mich., has been promoted to assistant to the division manager at Bay City. **Glenn B. Avis,** manager at Hudson, succeeds McDowell at Adrian.

**W. R. Leopold,** assistant to the vice president of Worthington Pump & Machinery Corp, has been appointed to direct operations of the Public Works Division. **D. L. Gallagher** has been named manager of the division. Since 1950 he has been assistant manager.


# NEW

## Coffing Challenger

*What you have been waiting for in a Spur-Gear Hoist*

**Light Weight**

**Carry it with one hand.** One-ton model, with coil chain for standard lift of 8 ft., weighs only 38 lb.

**Ruggedly Dependable**

**Use it year after year.** Long life is built in . . . sealed in. Housing is formed steel plate—will not crack under sudden shock loads. Back plate is laminated for extra rigidity. Hoist mechanism has sealed-in lubricant.

**Safe**

**Trust it to protect men and equipment.** Tested at 100 percent overload. All load-holding parts are special alloy steel. This hoist actually has a five-to-one safety factor.

**Economical**

**Service it yourself.** The Challenger may be completely disassembled in minutes with simple tools. No lost travel time to and from the factory for repairs.

**Find out more about the all-new Coffing Challenger, available in ½- and 1-ton capacities. Write for Bulletin E11C.**

**COFFING HOIST COMPANY**
**Danville, Illinois**

QUIK-LIFT ELECTRIC HOISTS • HOIST-ALLS • RATCHET LEVER HOISTS • MIGHTY-MIDGET PULLERS • DIFFERENTIAL CHAIN HOISTS • LOAD BINDERS • I-BEAM TROLLEYS

# It's your SCRAP for more Steel!

**CASE STUDY NO. 1:**

### 88 Carloads

Here's a photographic equipment manufacturer with a systematic metal-salvage program. No more scrap, they said. Yet, after more careful study, they found 88 carloads of heavy iron and steel scrap in a 30-day period!

**CASE STUDY NO. 2**

### Metalworking Plant Surprised!

This big fabricator reported all scrap being turned in. When told needed scrap includes old equipment, not just "production" scrap, they uncovered extra tons of iron and steel.

**CASE STUDY NO. 3:**

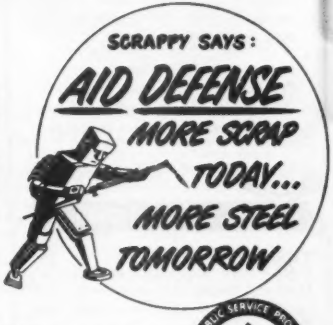
### Paper Converter Delivers!

This plant replaced 3000 obsolete machines with new ones. Held old ones for occasional spare parts. Changed mind, scrapped 2800, reduced inventory.

You, too, may have iron and steel scrap you don't know about. Almost *any* plant has.

That scrap is badly needed to aid defense. Steel mills may have to let furnaces grow cold unless they get more scrap to meet the needs of greatly expanded capacity.

Remember—we need 3000 carloads of scrap a day for steel mills and foundries—much more than we are getting now. Every pound counts. Start *your* scrap salvage program *today* by writing for your copy of "Top Management: Your Program For Emergency Scrap Recovery", to Advertising Council, 25 W. 45 St., New York 19, N. Y.




**NON-FERROUS SCRAP IS NEEDED, TOO!**

*This advertisement is a contribution, in the national interest, by*

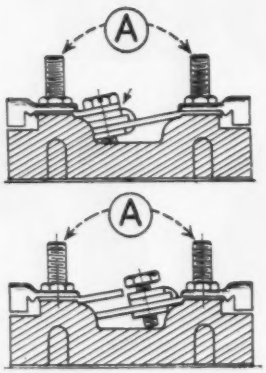
**McGRAW-HILL PUBLISHING COMPANY, INC.**

330 WEST 42nd STREET, NEW YORK 18, N. Y.

A PUBLIC SERVICE PROJECT THE ADVERTISING COUNCIL

**STATES TYPE NT TERMINAL BLOCKS...**

**the Shortcut to QUICKER, SAFER, EASIER CIRCUIT CHECKING**




**Here's all you do!**

(1) Just attach instrument to terminal posts

(2) Slide link out of contact — take reading

(3) Slide link back and bolt in position.

That's all there is to it! And remember, all testing is done without disturbing permanent wiring. States type NT terminal blocks are built in any number of poles desired, front or back connected, with or without coding strip, with or without cover.

Can you use a shortcut to quicker, safer, easier circuit checking? States type NT terminal blocks is the answer.

Cut Out and Mail Today to

THE STATES COMPANY
3 New Park Avenue
Hartford, Conn.

Please send Cat. No. 1, Sec. 6 for further information.

Name ..... Title .....

Firm .....

City ..... Zone ..... State .....


## J. M. Huebner Advanced by Pennsylvania P&L Co

James M. Huebner, vice president of the commercial department of Pennsylvania Power & Light Co, has been named vice president of the utility succeeding L. W. Heath who has

J. M. HUEBNER

R. C. SWARTZ

retired. Ralph C. Swartz, assistant to the vice president of the commercial department, replaces Huebner.

Huebner joined Pennsylvania P&L in 1924 as a student in its line department. After a short period as a PP&L power sales engineer, he became district manager at Catasauqua, and in 1926 division manager at Bethlehem. Early in 1939 he was transferred to the Lancaster division and promoted to vice president of that division. Huebner became vice president of commercial operations in 1949.

Assistant to the vice president of commercial activities since 1935, Swartz started with PP&L in 1928 as a rate engineer.

Heath came to PP&L in 1923. He was made a commercial vice president in 1935 and vice president in 1949.


**NOW you can bend Thin-Wall Conduit profitably**

Here's the efficient way to bend 1¼, 1½ and 2" electro-metallic tubing. It's done with Blackhawk's remarkable all-directional "Porto-Power" hydraulic unit.

**BENDING SHOES create kinkless, wrinkle-free bends matched offsets**

There's no crushing. You get 90° bends in just one setting. Remote-operation permits bending on the bench or floor — in the most convenient position for handling, sighting and measuring pipe.

**ONLY Porto-Power gives you these benefits**

The bending assembly for 1½" conduit weighs only 50 lbs. This means easy handling . . . no wrestling with heavy, clumsy equipment. The equipment pays for itself on the first good job.

Write for free Bulletin No. 50B on Benders for both Rigid and Thin-Wall Conduit . . . plus spectacular HYDRAULIC Knock-Out Punches. See leading wholesalers or write Blackhawk Mfg. Co., Dept. P-41111, Milwaukee 1, Wis.

**BLACKHAWK**

## OBITUARY

**Sears B. Condit,** 79, chairman of the board of Chase-Shawmut Co, Newburyport, Mass., died at Boston Oct. 31. Condit helped establish Chase-Shawmut and for many years served as its president. In 1894 he had charge of the experimental department of Stone & Webster which was reorganized as L. A. Chase & Co. Later the company was consolidated with Shawmut Fuse Wire Co. In 1904 Condit founded Condit Electrical Manufacturing Co at Boston and served as its president until 1925. Condit Electrical later was acquired by Allis-Chalmers Manufacturing Co.

**Charles A. Lehman,** 41, commercial sales manager of Staten Island Edison Corp, died Nov. 5 at West New Brighton, S. I. He had been with the utility since 1935. Prior to joining Staten Island Edison, Lehman worked for General Electric Co.

**Roy M. Smith,** former chief engineer of Railway & Industrial Engineering Co, died Oct. 30. With the company since 1945, Smith served as distribution engineer and became chief engineer in 1950. Illness forced him to relinquish this post last spring. Before joining R&IE, Smith worked for Westinghouse Electric Corp, Bryant Electric Co, Roller-Smith Co, and Pacific Electric Manufacturing Co.

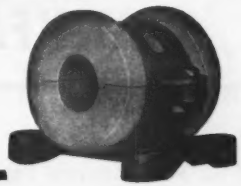
**Lyle Bradford Robinson,** 58, a member of General Electric Co's electrical engineering department at Seattle, Wash., died Nov. 1. He was a specialist on illumination and transformers and for many years had charge of selecting college engineering graduates for jobs with GE. Robinson joined GE in 1917.

**Forrest C. Simmons,** 43, supervisor for Virginia Electric & Power Co at its 12th St. plant in Richmond, died in that city Nov. 6.

**Samuel P. Coffin,** 68, chief engineer of the Massachusetts Department of Public Utilities, died Nov. 4 at Quincy, Mass. He had been on the commission's staff since 1930.

**James P. King,** 62, superintendent of the municipal electric light department at Peabody, Mass., died Nov. 6 in that city.


**BE PREPARED FOR POSSIBLE SHORTAGES**



Is your power wiring program liable to be hampered by shortages of critical materials, required to conceal it?

You can still proceed by using open wiring carried on "Three E" clamp insulator supports.

They are economical, easy to install, and provide a rigid support.

Made for insulated conductors ⅝" to 3½" in diameter. Satisfactory for A.C. or D.C. service, indoors or outdoors. Three E carries ample stocks for prompt shipment.

***Ask for Bulletin 201 giving complete description and listings.***

**ELECTRICAL ENGINEERS EQUIPMENT CO.**
**MELROSE PARK, ILLINOIS**

**HARPER *can tell you...***

because Harper deals in them *all!* Long experience and specialized production in all types and sizes of fastenings in *all* alloys mean just the right kinds for your needs—whether your problem is corrosion, abrasion, heat, stress, or appearance. Over 7000 items—bolts, screws, nuts, rivets and accessories—in stock ready for delivery from warehouses and distributors, nationwide. Send coupon for information and New Harper Catalog.

HARPER
EVERLASTING FASTENINGS

The H. M. Harper Co.,
8205 Lehigh Ave., Morton Grove, Ill.
Send my free copy of New Harper Catalog.
(Please Print)
Name.....
Address.....
City.....State.....

**SPECIALISTS IN ALL NON-CORROSIVE METALS**

# MANUFACTURERS and MARKETS

## UE Workers at 5 Plants of GE Vote Against Strike

The membership of the United Electrical Radio and Machine Workers of America, independent, has voted against a strike at five General Electric Co plants.

At the company's large Schenectady plant union members voted 7,221 to 6,496 against a strike. The other plants are at Taunton, Mass., Elmira, N. Y., Decatur, Ind., and DeKalb, Ill.

Votes favoring a strike by varying majorities were reported by UE at other GE plants accounting for about half the employees for which the union bargains.

The strike vote was ordered by the national UE conference board after the union turned down GE's offer of a 2½% wage increase plus a cost-of-living adjustment. This offer has been accepted by the International Union of Electric Workers, CIO, and more than 38 unions in the company. UE, which was to have met Thursday with GE officials, seeks a straight 15¢-an-hour increase.

•

## Wagner Operates Truck Transformer Service

Wagner Electric Corp, St. Louis, has placed into operation a special truck unit equipped to handle practically all types of power transfomer field service. The mobile unit will assemble new transformers which may be shipped unassembled.

To facilitate installation or removal of bushings, radiators, conservators, and other auxiliary equipment, the truck is equipped with a 6,000-lb power-driven cab-controlled winch and a 30-ft telescoping steel gin pole. A Wagner rotary compressor, which furnishes compressed air for the truck's brakes, also supplies the compressed air for pressure testing of transformers. It is also used as a vacuum pump for removing air bubbles and pockets from transformer liquid.

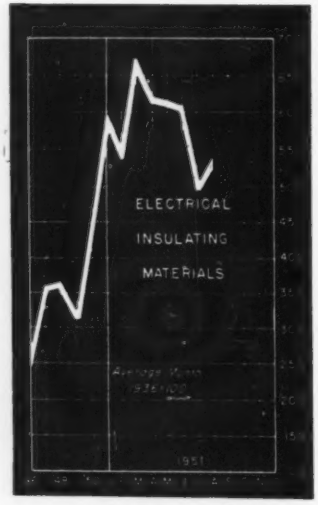
The truck carries a filter press, an oven for keeping the filter paper dry, an oil dielectric testing transformer, a transformer oil acidity tester, a megger, and a black light leak detector for testing and servicing transformers. The unit is equipped with its own welding generator, and a 60-cycle, 110/220-v, one-phase generator.

•

## Insulating Materials Sales Increase 9% in August

Sales of electric insulating materials increased in August, rising 9% over those for July.

The index for sales billed, compiled




by the National Electrical Manufacturers Association, increased to 539 in August compared with 494 in July. August sales were 16% higher than those for August, 1950, when the index read 466.

•

## Starts Copper Mine Work

Phelps Dodge Corp is starting preliminary work on an open-pit at Bisbee, Ariz. The company will spend about $25 million on the project, known as Lavender Pit, before the mining of low-grade copper ore begins.

## Kaiser Aluminum to Raise Chalmette Plant Output

Kaiser Aluminum & Chemical Corp plans to double capacity of its aluminum reduction plant under construction at Chalmette, La. near New Orleans. Announcement of expansion plans closely follows the signing of a letter supply contract whereby the government agrees to buy for five years all production from the new 100,000 ton-a-year aluminum plant not otherwise marketed. Expansion now planned will bring aluminum plant production capacity to 200,000 tons a year and the power plant capacity to 478,200 kw.

The United Gas Pipeline Co has agreed to supply the power plant's natural gas fuel needs.

Kaiser also will raise production at its alumina plant at Baton Rouge to 800,000 tons a year and will speed mining of bauxite deposits at Jamaica.

•

## U. S. Stockpiling of Tin Halts; Cut in Use Planned

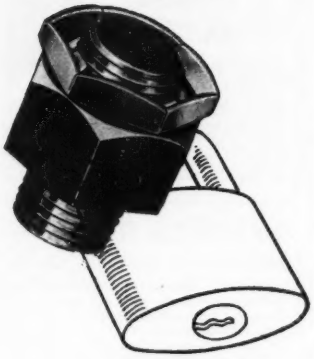
The U. S. government recently halted the stockpiling of tin to enable all available supplies to go to industry. It also announced that further cuts would be made in civilian use of the metal.

Defense Production Administration, in announcing the action, attributed it to the inability to obtain foreign tin at a "fair and reasonable price." Bolivia has been holding out for a price of $1.50 a lb. The Reconstruction Finance Corporation, which purchases tin for stockpiling, contends that $1.12 a lb is a reasonable price for foreign tin. Shipments from Bolivia have all but ceased during the past five months.

**Metal Prices**
**Nov. 12, 1951**

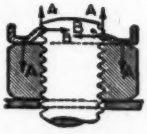
| | |
|---|---|
| COPPER, Conn., V., lb | $ .24½ |
| LEAD, N. Y., lb | .19 |
| ZINC, prime Western, E. St. Louis, lb | .19½ |
| TIN, Straits, qual. N. Y., lb | 1.03 |
| ALUMINUM, ingot, base price | .19 |
| NICKEL, base price | .56½ |
| STEEL, billets, Pitts., ton | 56.00 |
| STEEL, scrap, No. 1 heavy, Pitts., ton | 45.00 |

# Both Nut and Bolt are LOCKED TIGHT



**—*with* PALNUT Double Locking Action**

Powerful spring tension (A-A) is exerted upward on the bolt threads and downward on the ordinary nut, while slotted jaws (B-B) close in and grip the bolt like a chuck.

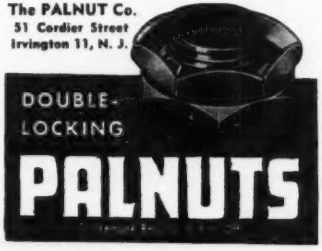



*Absolute Security—Low Cost*

PALNUT Lock Nuts apply on *top* of ordinary nuts. No interfering parts within the nut, no spring washers between nut and seat to interfere with maximum bolt loading, or to reduce electrical conductivity. Nut cannot loosen—bolt cannot back out under severest vibration. Very low in cost; easy, speedy assembly; may be removed and re-used; special finishes for utility use.

*Send for samples and literature.*

**The PALNUT Co.**
**51 Cordier Street**
**Irvington 11, N. J.**





Tin at the RFC-operated smelter at Texas City, Tex., sells for $1.03 a lb.

An RFC spokesman said that the Texas City smelter has enough ore lined up for four or five months' operation.

DPA is expected to curtail use of tin plate—used in tin cans—and restrict the output of brass and bronze used in hardware, furniture, and other consumer and industrial products.

•

## GE Training Program for Non-Engineers Set Up

General Electric Co's Apparatus Division has established a training program for non-engineering college graduates designed to qualify them for sales assignments formerly held by graduate engineers. The program has been set up because of the growing shortage of engineers.

The trainees, liberal arts or business administration college graduates, will go through a nine-week intensified course in basic electricity, a 12-month assignment on the company's Test Course, and two years of specialized sales training. During the nine-week course, the trainees will study magnetism, instruments, dc motors and generators, transformers, alternators, induction motors, and ac controls.

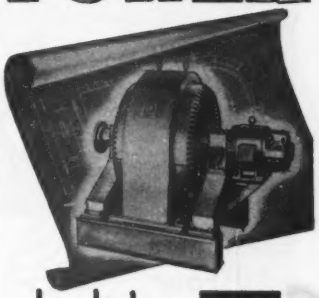
A total of 29 trainees are already enrolled in the program working presently on the Test Course at GE plants throughout the country.

## MANUFACTURING BRIEFS

**World tin ore production** totaled 13,200 long tons in August compared with 13,600 tons in July, the International Tin Study Group has reported. The decrease was attributed to the drop in Bolivian exports from 2,809 tons to 2,395 tons. World tin metal output in August amounted to 15,500 tons, an increase of 3,500 tons over July. There were sharp rises in output in Malaya and The Netherlands. United States production also showed an increase. World tinplate production rose to 512,000 tons from 442,000 tons in July with U. S. output of 384,338 tons reaching the highest point since August, 1950.

**Sylvania Electric Co** has leased a building in Dallas, Tex., at 173 Leslie Street as headquarters for its new


for custom-engineered POWER



look to... EP

Since 1909, the job of The Electric Products Company has been to create and develop special electrical rotating equipment . . . motors and generators to do existing jobs better or to reach into new fields to do jobs that couldn't be done before. The natural "by-product" of our more than 40 years of specialization is that you get equipment designed and built to the exact requirements of your application . . . equipment that has greater dependability, longer life and that requires less maintenance.

Send in the coupon below for detailed information about our Custom-Engineered synchronous motors and generators . . . d-c motors and generators . . . induction motors . . . battery chargers . . . frequency changers.

A nation-wide sales engineering and service organization stands ready to meet all User requirements.

THE ELECTRIC PRODUCTS COMPANY

1731 CLARKSTONE ROAD
CLEVELAND 12, OHIO

Attach coupon to your letterhead for your copy of Bulletin 2-200

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE____ STATE_____
X-74

**Combines All Four**

EVERY requisite that sound construction needs demand are combined in *Crapo* Galvanized Steel Strand—

**1. High strength**
**2. Ruggedness**
**3. Long life**
**4. Economy**

The superior tensile strength inherent in steel is utilized to fullest advantage in each size and grade of this time-proved strand. The heavy, ductile, tightly-adherent galvanized coating—applied by the famous *Crapo* process—provides dependable protection to the steel, extends the life of the strand beyond the normal period of replacement.

**Specify *Crapo* Galvanized Steel Strand for guys, messenger and overhead ground wires! There is a size and grade for every practical need available for prompt shipment.**

**ASK YOUR JOBBER!**

Consult your nearest distributor of *Crapo* Products or write direct for further information!

**INDIANA STEEL & WIRE CO.**
MUNCIE, INDIANA


Southwest division. The building, containing 20,000 sq ft of floor space, was opened Nov 1. The Dallas house will distribute incandescent and fluorescent lamps, television and radio tubes, and other electrical devices in Texas, New Mexico, and Oklahoma.

**National Association of Electrical Distributors** officially has opened new and larger headquarters offices at Norway House, 290 Madison Avenue, New York City. The move was necessitated by increasing membership and an enlarged staff.

**Crosley Division** of Avco Manufacturing Corp plans to buy the physical assets of Brand & Millen, Ltd, Long Branch, Ont., radio and television manufacturers. Crosley intends to organize a wholly owned subsidiary, Crosley Radio & Television, Ltd, to conduct radio and television manufacturing and distribution activities formerly carried on by the Long Branch firm under contract with Crosley.

**Heat pump air-conditioner,** which General Electric Co recently began selling commercially, will be produced in three and five hp sizes at an average cost to consumers of about $2,300.

## SALES ASSIGNMENTS

**Graybar Electric Co** has appointed Charles G. Campbell operating manager of its Reading, Pa., branch and Howard Sommer operating manager of the Memphis, Tenn., branch. Campbell has been an office salesman since 1947 and Sommer district supervisor of training at St. Louis since 1949.

**General Electric Supply Corp** has named W. A. Karrick sales manager of supplies and apparatus for the Cincinnati District office. He joined the company in 1927 and most recently has served as a power apparatus specialist.

**Westinghouse Electric Supply Co** has appointed Nels A. Hjelte manager of the Des Moines branch. He succeeds Merton M. Welton who has retired. Hjelte, with the company since 1932, has been general lamp manager in New York for four years.

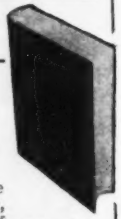
**Allis-Chalmers Manufacturing Co** has appointed Tom W. Metz manager of the Indianapolis district of the general machinery division and Robert F. Loos manager of the Evansville district, formerly a branch office.

**General Electric Co's Locke Department** has appointed Eugene E. Wejman its representative in GE's Pittsburgh office.


**HEATING DESIGN AND PRACTICE**

*Just Published!*

Fully covers the design, application, and control of radiant heating and baseboard units, the heat pump, space heaters, fireplaces, fans, and filters. Such components as boilers, steam generators, grates, stokers, stacks, and chimneys are thoroughly treated. A section on fuels and combustion shows you the classifications of various fuels, and their relative combustion characteristics. **By Robert H. Emerick, Consulting Engineer. 453 pp., 6 x 9, 224 illus., 117 tables. $8.00.**



**ELECTRONIC MOTOR and WELDER CONTROLS**

Practical help for those who must select, install, or service electronic controls for motors and resistance welders. Explains circuit operation of tube-operated equipment found in the two major groups of motor and resistance-welding control. Each chapter starts with an introduction to a complete electronic equipment and then splits it into its component circuits, pinpointing each operation with simple descriptions and diagrams. **By George M. Chute, 346 pages, 187 illus., $6.50**

**ELECTRICAL INSULATION**

Brings you a wealth of data on electrical insulation methods and materials, emphasizing recent developments in the design and application of high-temperature insulation in shipboard installations. Covers general wire and commutator construction, assembly and wiring problems, the setting up of an inspection and maintenance program, etc. **By Graham Lee Moses, Mgr., Insulation Development Section, Westinghouse Elec. Corp., 259 pages, 88 illus., $5.50**

**FUNDAMENTALS OF ATOMIC PHYSICS**

*Just Published!*

Gives engineers groundwork in atomic and nuclear fundamentals, in the simplest possible treatment. Covers the kinetic theory of gases, the charge and mass of electron, electronics, photoelectric effects, X-rays, the Bohr theory of the origin of spectral lines, electron configuration in atoms, etc. Deals with matter waves, isotopes, and other important factors. Supplies an understanding of the quantitative relations involved in atomic and nuclear structures. **By Saul Dushman, Research Consultant, Gen. Elec. Co., Schenectady, N. Y. 294 pages, illus., $5.50**

**SEE THESE BOOKS 10 DAYS FREE**

McGraw-Hill Book Company, Inc.
330 W. 42nd St., N.Y.C. 18

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus a few cents for delivery, and return unwanted book(s) postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

- ☐ Emerick—Heating Design—$8.00
- ☐ Chute—Electronic Controls—$6.50
- ☐ Moses—Electronic Insulation—$5.50
- ☐ Dushman—Atomic Physics—$5.50

(Print)
Name .....
Address .....
City .....Zone....State.....
Company .....
Position .....W-11-19

This offer applies to U. S. only.

## NEW ELECTRICAL CONSTRUCTION

**NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included**

### UTILITIES

#### *Proposed Construction*

**California**—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. Roseville, transformers, exchangers, etc. Folsom Power Plant, Central Valley Proj., Spec. DS 3565. L. N. McClellan, ch. engr.

**Idaho, Mountain Home**—U. S. Eng., City-County Airport, Walla Walla, Wash., plans by C. Allen, Pocatello, cold storage bldg., base operations unit, photo lab, crash fire station and parachute bldg.; plans by G. Stanton, Concord Bldg., Portland, Ore., training bldg.; plans by R. L. Morin, Pub. Service Bldg., Portland, Ore., laundry and dry cleaning unit; plans by M. P. Williams, Sherlock Bldg., Portland, Ore. warehouse and special vehicle bldg., all at Air Force Base.

**Ind., Terre Haute**—Public Service Co. of Indiana, Plainfield, power plant superstructure, $25,000,000. Sargent & Lundy, 140 S. Dearborn St., Chicago, 3, Ill., engrs.

**Mass., Charlestown**—First Naval Dist., 495 Summer St., Boston, raise roof boiler house, remove old bunkers, install bunkers greater capacity, $165,000; remove boiler fdn. Install fdns., etc., $176,000; provide mechanical fly ash precipitator, $121,000, at Naval Shipyard, Charles T. Main, Inc., 80 Federal St., Boston, consult. engr.

**Michigan**—State Hy. Dpt., 222 Townsend St., Lansing, Zone 13, proposed electric power regulator houses on Edsel Ford Expressway, UI E 3 of 82-22, Cl. UI E 4 of82-22, Cl. Plans deposit $3. M. H. Frimodig, c/o owner, engr.

**Miss., Petal**—Dixie Electric Power Assn., Laurel, warehouse-office. Plans deposit $10.

**Missouri**—Northwest Electric Power Co-operative, Cameron, 36 sub-stations. Extended date. Henningson, Durham & Richardson, Standard Oil Bldg., Omaha, Neb., engrs.

**Montana**—Bonneville Power Admin., 827 N. E. Oregon St., Portland, Ore., 78.6 mi. Hungry Horse-Hot Springs, 230 kv rural distr. line, Flathead, Lake and Sanders Counties. Plans deposit $25. L. C. Stewart, c/o owner, engr.

**N. M., Los Alamos**—U. S. Atomic Energy Comn., Los Alamos, physics bldg. $2,500,000-$3,000,000. Plans deposit $50.

**O., Columbus**—U. S. Eng., 237 Fourth Ave., Huntington 18, W. Va., armament-electronics (K-1) camera and instrument repair shop, Lockbourne Air Force Base, approx. 10 mi. southeast of here, Franklin Co., Serial No. ENG 46-022-52-72.

**South Carolina**—Central Electric Power Co-operative, 2G Cornell Arms Bldg., Columbia, 120.3 mi. rural distr. lines, 50-A Santee, Sect. 6 Aiken, Edgefield and Saluda Counties. Extended date. Southern Eng. Co., 1000 Crescent Ave., Atlanta, Ga., engrs.

**Tennessee**—U. S. Eng., 303 U. S. Court House, Nashville, Zone 1, installing third 20,000 kva. generating unit in Dale Hollow Hydro-electric Power Plant, Obey River, Clay Co., Serial No. CIVENG 40-058-52-18.

**Tex., Dallas**—Dallas Power & Light Co., Dallas Power & Light Bldg., construct 90,000 kw electric generating plant. $9,500,000.

**Washington** — Bureau Reclamation, Dpt. Interior, Ephrata, electrical distr. sys. at O'Sullivan Dam, Columbia Basin Proj., Spec. 117C-125. L. N. McClellan, Bldg. 1A, Denver Federal Center, Denver, Colo., ch. engr.

**Wash., Arlington**—Dpt. Navy, Yards & Docks annex, Arlington, Va., three 100-kw and two 600-kw diesel generating units for standby power plant at Jim Creek Communications Station, Spec. 30491. Plans deposit $10.

**Wash., Spokane**—Columbia Elec. & Mfg. Co., W1024 Ide St., 1 story, 200x500 ft. factory addn., and mill construction, $400,000.

**Wash., Tacoma**—U. S. Eng., 4735 E. Marginal Way, Seattle, 4, Wash., transmiter bldg. for UHF radio air-ground


A BIG PART OF THE POWER PICTURE

EQUIPMENT BY

CONTROL CORPORATION

Wherever power is present

CONTROL CORPORATION EQUIPMENT is today's answer to remote and continuous supervisory control of sub-stations, hydro-plants and pumping stations. When the going is rough and reliable communication is most important, you can expect Control equipment to perform better.

**WHEREVER** reliability and speed are important, wherever cost of maintenance is a major considering factor, wherever initial cost influences purchase, you will do the job better if you use Control equipment.

**GET THE FACTS** . . . if supervisory control, telemetering or communication fit into *your* power picture, write us first for complete information.

CONTROL CORPORATION
719 CENTRAL AVE. N.E. MINNEAPOLIS 14, MINN.
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

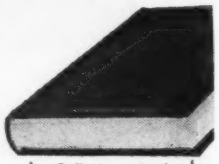
*Now in permanent reference form . . .*

Electrical World's valuable record of

# THE DEVELOPMENT OF MODERN ELECTRIC SYSTEMS and APPARATUS

HERE IS the sweeping panorama of the evolution of energy generation, distribution and utilization. This is the story of the progress of the great American electric power systems, both private and public, and the philosophy and social and economic forces underlying their growth.

Designed for easy reading, this book brings you in compact form the unique record of the development of hydro- and turbo-electric power plants—of techniques for the construction, operation and maintenance of the far-flung systems—of public regulation over companies, their rates and their profits—of the spasmodic movements for federal and municipal ownership of electric utilities—and of the rise of industry organizations.



**Reflects extensive research in the electrical power field, and is composed wholly of material as presented in the pages of *Electrical World*.**

## THE ELECTRIC POWER INDUSTRY

### *PAST, PRESENT and FUTURE*

Compiled by the Editors of *Electrical World*

**178 pages, 8½ x 11, illustrated, $4.00**

*Discusses—*

- Power Systems
- Power stations
- Station generation
- Transmission
- General system techniques
- Distribution
- Maintenance and metering
- Use of electricity
- Organization and regulation
- Industry organizations

THIS SURVEY of one of the world's greatest industries, spanning three quarters of a century, is a permanent bound edition of the 75th Anniversary Number of *Electrical World*. Outstanding specialists from coast to coast contributed their knowledge and research to make this volume a unique log of industry achievement.

Every major phase of electric power development is covered — generating equipment transmission lines, protective relaying, substation design, power metering, rural electrification holding companies, state regulation, N.E.M.A. Edison Electric Institute, National Electrical Wholesalers Association, etc., etc.

*The Electric Power Industry* is truly a landmark along the road of free enterprise and scientific progress. It belongs in the library of every electrical man, those just entering the field, and students of this and related industries.

**SPECIAL QUANTITY DISCOUNTS**

Ideally suited for training of junior executives, sales staffs, and for use by other groups and key persons in the utilities field. When used for these purposes, books are available at special rates. In requesting discount information let us know number of copies you will need. Direct inquiries to:

SPECIAL SERVICE DEPARTMENT

Attention: H. D. Brown

McGraw-Hill Book Co. 330 W. 42nd St., N.Y.C. 18

**SEE THIS BOOK 10 DAYS FREE**

McGRAW-HILL McGraw-Hill Book Company, Inc. 330 W. 42nd St., New York 18

Send me **The Electric Power Industry** for 10 days' examination on approval. In 10 days I will remit $4.00, plus a few cents for delivery or return book postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

Name .....

Address .....

City ..... Zone ..... State .....

Company .....

Position ..... FW-10-32

This offer applies to U.S. only.

facility at McChord Air Force Base, ENG 45-1108-52-99.

**Wyo., Laramie**—At office Bd. Trustees, University of Wyoming, Laramie, furnishing, erecting one steam generating unit, incl. boiler, superheater, water walls, air heater, fans, ducts and all auxiliaries at University heat and electric plant. Lutz & May, 819 Finance Bldg., Kansas City 6, Mo., consult. engrs.

### *Low Bidders & Contracts Awarded*

**Calif., San Francisco**—R. A. Bell, 901 S. Primrose St., Monrovia, Calif., $747,750, diversion tunnel and power tunnel appurtenances Cherry River Project, Stanislaus National Forest, Public Utilities Comm., City Hall, San Francisco, Calif. Bids Oct. 23.

**Fla., Cocoa**—Ernest Waters Constr. Co., Daytona Beach, Fla., LB, $1,932,520, electrical distr. sys. for Theodolite and Camera Stations at Patrick Air Force Base, Inv. NEG-JAX-51-22. U. S. Eng., 575 Riverside Ave., Jacksonville, Fla.

**Ill., Skokie**—Edwin E. Hartrich & Son, 141 W. Jackson St., Chicago, 4, Ill., CA, $120,000, 1 story factory. Electric Hose & Rubber Co., 900 W. Jackson St., Chicago, 6, Ill. Awarded 10/18.

**Kans., Kansas City**—Foster Wheeler Co., 1004 Baltimore St., Kansas City 6, Mo., CA $231,965, 40,000 sq. ft. condenser for Kaw River power plant, 20 and Kansas Ave. Bd. P. Utilities, c/o Girard B. Little, secy., City Hall, Kansas City, Kan.

**Nebr., Beemer**—Evans Electric Constr. Co., 1617 Cuming St., Omaha, Neb. LB $189,824. Electric sub-station, near here. Loup River Public Power Dist., Columbus, Neb. P. E. Hampton, c/o owner, ch. engr.

**Oregon**—English Electric Co. Ltd., Stafford, England, LB $2,223,530, three 42,222 kva. generators for Lookout Point Dam, CIVENG 35-026-52-79. Lane Co. U. S. Eng., Pittock Block, Portland, Ore.

**Oregon**—Jerome Hydraulics Co., 60 Ocean Ave., Lynbrook, N. Y. LB. $165,300. hydraulic units for intake gates, McNary Dam powerhouse, CIVENG 45-164-52-28. U. S. Eng., Bldg. 602, City-County Airport, Walla Walla, Wash. Bids Oct. 30.

**Tennessee**—L. O. Brayton & Co., Dyersburg, Tenn., LB. $92,743, 66.2 mi. rural distr. lines, Lewis, Perry, Hickman and Stewart Counties. Meriwether Lewis Electric Co-operative, Centerville, Tenn. Bids Oct. 16.

**Texas**—Irby Constr. Co., 817 S. State St., Jackson, Miss. LB. $177,464,* est. $165,000. 182 mi. rural distr. lines, 81 mi. new membership extens. and tie lines; 101 mi. conversion, Bowie, Cass, Titus, Morris and Red River Counties. Bowie-Cass Electric Co-operative, Douglasville, Tex. Bids Oct. 25.

**Texas**—Southwestern Bell Telephone Co., Nacogdoches, Tex., Force Account $75,000. construct unit of rural pole telephone lines, in northern sect. of Nacogdoches Co.

**Wash., Tacoma**—Agutter Electric Co., 952 E. Seneca St., Seattle, Wash., CA, $957,580, est. $1,020,542, aircraft refueling sys. at McChord Air Force Base, ENG 45-108-52-32. U. S. Eng., 4735 E. Marginal Way, Seattle, 4, Wash. Bids Sept. 21.

## INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

### *Proposed Construction*

**Ill., Skokie**—Croname, Inc., 3701 Ravenswood St., Chicago, Zone 13, 1 and 2 story, 600,000 sq. ft. factory, at Touhy and Carpenter Sts., $5,000,000. Victor L. Charn, 4744 W. Rice St., Chicago, Zone 51, archt.

**Miss., Meridian**—City, plans by Morris L. McNair, Rosenbaum Bldg., Krouse & Yarbrough, WMOX Bldg. and L. L. Brassfield, Kidder Bldg., plant for Textron, Inc. $5,000,000. Bill Archer, WMOX Bldg., engr.

**Tex., Dallas**—City, City Hall, Main and Harwood Sts., and Dallas Co., Court House, 8 story, bamnt., 650-bed, masonry city-county hospital. $6,500,000. Plans deposit $200. Extended date. DeWitt & Swank, 2025 Cedar Springs Rd., arhcts.

**Ont., Oakville**—Ford Motor Co. of Canada Ltd., Windsor, assembly plant on 420 acre site with 1 story, brick, steel factory and auxiliary bldgs. $45,000,000. Giffels & Vallet of Canada Ltd., Canada Trust Bd., Windsor, and Gore & Storrie, 1130 Bay St., Toronto, consult. engrs.

# BOOK REVIEWS

### Libraries

***Technical Libraries. Their Organization and Management.*** **Edited by Lucille Jackson. Published by the Special Libraries Association, New York 3. 202 pages, illustrated. Price $6.00.**

If you have put off developing a library because you are not sure where to begin, or because you are not yet convinced of its worth, this new guidebook on technical libraries will help solve your problem. Based on the experience of over 5,000 librarians in private industry, government agencies, research laboratories, and other fields, it gives a practical, easy-to-understand picture of how such libraries operate. It presents tested, time-saving methods and ideas for setting up such facilities effectively and economically, and evaluates the benefit to be derived therefrom, enabling the executive to decide whether such a library would be a worthwhile addition to his business.

### Accounting

***Public Utility Accounting.*** **By J. Rhoads Foster and Bernard S. Rodey, Jr. Published by Prentice-Hall, Inc, New York. 690 pages, illustrated. Price $10.**

To those who have evinced an interest in public utility accounting this book is recommended. It is probably the first book that treats this subject in such a comprehensive manner. It illustrates how books and records are organized to do the accounting job. It discloses, in easy language, the accounting conventions and customs which have existed for so many years in practice but which previously had never been codified. The book discusses in detail such subjects as utility regulation, uniform system of accounts, books and records, balance sheet accounts, utility plant, construction and original costs, internal audits, budgetary controls, depreciation, labor, taxes, consolidations, and preservation and destruction of records.

### Computers

***The Preparation of Programs for an Electronic Digital Computer.*** **By M. V. Wilkes, D. J. Wheeler and Stanley Gill. Published by Addison-Wesley Press, Inc, Cambridge 42, Mass. 169 pages, illustrated. Price $5.**

Text here is entirely devoted to the conversion of the operations into code terms for introduction into electronic digital computers, particularly the Electronic Delay Storage Automatic Calculator (EDSAC). Illustrations given are entirely on the binary rather than decimal basis. Very little space is devoted to a physical description of the computer. The objective is one of explaining how it is used, especially by resort to the library of routines here presented.

### Feedback Control

***Automatic Feedback Control.*** **By W. R. Ahrendt and J. F. Taplin. Published by McGraw-Hill Book Co. 412 pages, illustrated. Price $7.50.**

While mathematical in early treatment the authors have taken unusual pains to interpret the differential equations in terms of the physical counterparts. In addition the subject matter is organized in logical, classified sequence so that the reader can readily follow the development. One feature that other authors could emulate is the listing up front of symbols used through the book with a parallel listing of the pages on which each is defined, explained, or first used. The latter half deals with discontinuities, servomechanism, pneumatic controls, temperature regulation, speed governing, flow and level of liquids.


*Do those plowed field jobs this winter when the ground is frozen!*

**Bore through FROZEN Ground WITH A PENGO Auger**

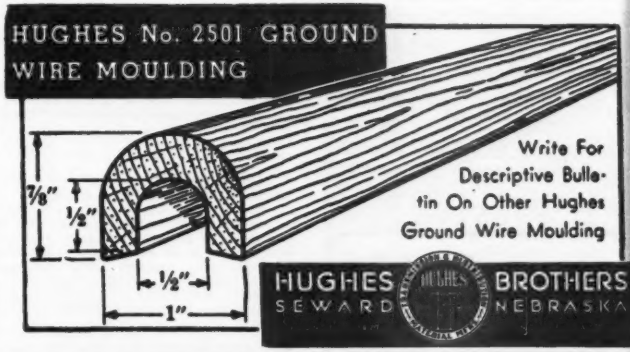
- ★ *Avoid crop damage*
- ★ *No getting stuck in the mud*
- ★ *Improve public relations*

DO a faster, *better* job with a scientifically-designed PENGO Auger—the twin-helix auger that bores clean, true holes in any kind of soil, most sandstones, hardpan, decomposed rock, frozen ground—and even in permafrost. Saves power, cuts maintenance to a minimum! 15 sizes; to fit any earth boring machine.

★ **ORDER NOW** *or write today for data and prices*

**PETERSEN ENGINEERING CO.**
**MANUFACTURERS**
SANTA CLARA, CALIFORNIA

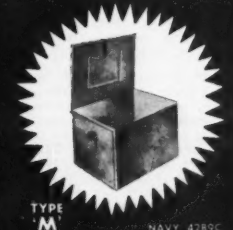
HUGHES No. 2501 GROUND WIRE MOULDING




Write For Descriptive Bulletin On Other Hughes Ground Wire Moulding

HUGHES BROTHERS
SEWARD NEBRASKA

*for* **NAVY SPARE-PARTS BOXES** IN STRICT ACCORDANCE WITH SPEC #JAN-B233




**19 STOCK SIZES—AT PUBLISHED PRICES!**

*NOW available to you..... without costly sub-contracting problems*

**stock standard TYPE M. STEEL SPARE-PARTS BOXES, made in strict accordance with Navy Specifications.**

**To better service your need for Specification Spare-Parts Boxes (shipboard use), we have taken them from our "Special" department and put them on a mass production line. RESULT: they can now, in most cases, be shipped from stock.**

**SIMPLY ORDER THEM BY STOCK NUMBER**
WRITE FOR SIZE AND PRICE CHART

DOLIN METAL PRODUCTS, INC.
121 LEXINGTON AVE BROOKLYN 16 N. Y.

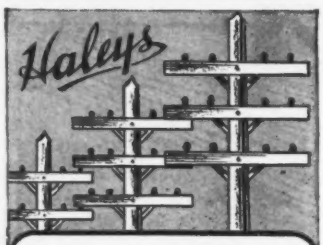
**PRESSITE**
an unsized fibreboard having excellent dielectric, physical and chemical properties. Is used principally in air, oil and askarel transformers.

**ELECTRITE**
a high grade board for electrical insulation, possessing high tensile and dielectric strength. Used in a large variety of punchings and other insulating applications.

**DENSITE**
an extremely hard and tough board of superior quality. Used by many leading manufacturers of electrical equipment to replace more expensive types of insulating materials.

**Pulp Products Department**

WEST VIRGINIA
PULP AND PAPER COMPANY
230 Park Avenue, New York 17, N. Y.
35 E. Wacker Drive, Chicago 1, Ill.




**CEDAR POLES**
**FIR CROSS ARMS**

PENTACHLOROPHENOL TREATED
LONG LIFE
CLEAN AND LIGHT IN WEIGHT

*Two Strategically Located Yards:*
MINNEAPOLIS, MINN.
FINDLAY, OHIO

R. G. HALEY & CO.
SPITZER BLDG. TOLEDO, OHIO

## CATALOGS • BULLETINS

● LATCHES AND HINGES: Complete line of Hartwell flush latches and hinges for variety of uses in industry are described in new 24-page bulletin. Also included are detail sheets of individual latch and hinge assemblieg. Issued by Hartwell Co, 9035 Venice Blvd, Los Angeles 34.

● DEVICES AND FIXTURES: Catalog 18 illustrates and describes more than 75 wiring devices and incandescent lighting fixtures. This 40-page publication furnishes full specifications together with shipping information. Available from John I. Paulding, Inc, New Bedford, Mass.

● VISCOMETERS: Complete up to date information about Brookfield viscometers and viscosity in general is presented in new "Brookfield Viscosity Packet." Data sheets, 8-page catalog, 1951 price lists, etc, are included. Write W. B. Brookfield, Brookfield Engineering Laboratories, Inc, Stoughton, Mass.

● ELECTRICAL TAPE: New 4-page brochure tells how "Scotch" electrical tape No 22 can be used to combat corrosive action of moisture, alkalies, oils, fats, and fungi on underground gas service pipes. Featured is a gas company's report which cites 6 advantages of this tape. Published by Minnesota Mining and Manufacturing Co, 900 Fauquier St, St. Paul 6, Minn.

● POWER PLANT EQUIPMENT: Bulletin Q-14, "Elliott Equipment for Power Plant and Industry" has recently been released. Complete Elliott line as well as a brief description of major steam and electrical products of 5 Elliott plants is presented. Bulletin comprises two sections, one on steam and related equipment, the other on rotating electrical equipment. Available from Elliott Co, Jeannette, Pa.

● LIQUEFIED GASES: New booklet summarizes work with production, handling, and storage of liquefied gases. Included in the booklet are descriptions of a hydrogen liquefier, liquid oxygen generator, helium refrigerator, and in addition non-contaminating gas holders and high flux density electromagnet. Booklets available form C. L. Jewett, Arthur D. Little, Inc, 30 Memorial Drive, Cambridge 42, Mass.

● ALUMINUM WELDING: "Technical Advisor 15," explains slope control as applicable to spot welding aluminum with ordinary arc welders. This method extends electrode life 20 to 30 times, by reducing heat produced at electrode tips by one-sixth the usual amount. This paper and future copies of Advisor available by writing on letterhead to Reynolds Metals Co, 2500 So. Third St, Louisville 1, Kentucky.

● CHART RECORDER: Strip chart recorder is described in 4-page bulletin MPC-1. How 6 permanent records of industrial processes are obtained on one strip chart plus the accuracy of the deflection type measuring circuit are explained. Complete specifications and listing of models are included. Request bulletin from Wheelco Instruments Co, 847 W. Harrison St, Chicago 7, Ill.

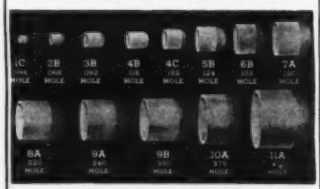
● LAMINATED PLASTICS: Handy specifications chart has been prepared to help engineers, specifiers, and buyers select proper grade of laminated plastic sheets, tubes, and rods. For tubes and rods, specifications cover Synthane, NEMA, military specification, military type, Navy 17-P-5 type, JAN-P-79, and ASTM designations. Grade designations for sheet materials cover: Synthane, military specification, military specification type, JAN-P-13, Navy 17-P-5 type, ASTM type, Army 71-484 type and Federal specification HH-P-256 for type and grade coding. Available without charge, Synthane Corp, Oaks, Pa.

**PAINTS OVER RUST!**
**RUSTREM STOPS RUST!**
**No priming, scraping, brushing**

Rustrem paints right over rust. For stacks, fire escapes, bridges, fences, flashings ...all metal. Farm, auto, marine, machinery. Black, aluminum, clear.

**SPECO, Inc.** 7308 Associate Ave. Cleveland 9, Ohio

**STAR INSULATING BEADS**




Use LAVOLAIN ball and socket beads for insulating bare wire. Heat resistant. High dielectric and mechanical strength. Made in U.S.A. Quality beads at low cost. Quickly applied. Flexible Beads shown above are approximately half actual size. Ask for list and samples.

**STAR PORCELAIN CO.**
51 Muirhead Ave. Trenton, N. J.

**WANTED**
**MORE IRON AND STEEL SCRAP... OF ALL KINDS!**

Steel mills and foundries need more scrap.

Not just "production" scrap from metal-fabricating plants . . . but also all sorts of *idle* iron and steel—from all types of plants.

Search *your* plant for this idle metal . . . work with your local scrap dealer to increase supplies of badly-needed iron and steel scrap.

**What to look for . . .**

obsolete machines, tools and equipment, no-longer-used jigs and fixtures, worn-out or broken chains, wheels, pulleys, gears, pipe, tanks, drums and abandoned metal structures. Non-ferrous is needed, too!

**McGRAW-HILL PUBLISHING COMPANY, INC.**
330 WEST 42nd STREET • NEW YORK 18, N.Y.

# Advertising In This Issue


Advertising Council, Inc..... 177
Allis-Chalmers Mfg. Co.....6, 70, 76, 77, 154, 155
American Bridge Co..... 49
American Steel & Wire Co....22, 23
Amplex Corp. ..... 168
Anderson Brass Works, Inc..... 136
Ansonia Electrical Co., Sub. Noma Electric Corp..... 139
Appleton Electric Co..... 30

Babcock & Wilcox Co.....46, 47
Bauer & Black Div., of the Kendall Co. ..... 63
Bell Telephone Laboratories..... 74
Bethlehem Steel Co..... 68
Blackburn Corp., Jasper..... 57
Blackhawk Mfg. Co..... 178
Blaw-Knox Co. ..... 158
Bowser, Inc. ..... 64
Brown Co. ..... 142
Buckingham Mfg. Co., Inc..... 138

Cable Spinning Equipment Co.... 166
Chance Co., A. B..... 143
Chase Brass & Copper Co., Inc... 42
Coffing Hoist Co..... 176
Collyer Insulated Wire Co..... 162
Continental-Diamond Fibre Co... 82
Control Corp. ..... 183
Crescent Tool Co..... 13

Davey Compressor Co..... 35
Delta-Star Electric Co.....Third Cover
Diamond Power Specialty Corp... 43
Directory of Engineers..... 188
Dolin Metal Products, Inc..... 185
Dow Corning Corp..... 165
Driver-Harris Co. ..... 78
Duncan Electric Mfg. Co..... 18

Electric Controller & Mfg. Co., The ..... 32
Electric Products Co., The..... 181
Electric Storage Battery Co., The. 83
Electrical Engineers Equipment Co. ..... 179
Engineers, Directory of..... 188
Everstick Anchor Co..... 150

Fairbanks, Morse & Co..... 167
Four Wheel Drive Auto Co..... 7

Gai-Tronics Corp. ..... 131
General Electric Co., Apparatus Dept. .....16, 24, 25, 119, 120, 121, 123, 124, 125, 127
Lamp Dept. ..... 153
General Radio Co..... 29
Graybar Electric Co..... 5
Grinnell Co., Inc..... 149
Gulf Oil Corp..... 36
Guth Co., The Edwin F..... 79

Haley & Co., Inc., R. G..... 186
Harper Co., H. M..... 179
Hazard Insulated Wire Works... 4
Honan-Crane Corp. ..... 56
Hubbard & Co..... 157
Hughes Bros. ..... 185

I-T-E Circuit Breaker Co.....44, 45
Indiana Steel & Wire Co..... 182
International Harvester Co..... 50
Irvington Varnish & Insulator Co.. 163

Johns-Manville ..... 152

Kearney Corp., James R..159, 160, 161
Kellogg Co., The M. W..... 17
Kuhlman Electric Co..... 27

Lapp Insulator Co., Inc.....14, 15
Leeds & Northrup Co..... 129
Line Material Co....51, 52, 53, 54, 55
Link-Belt Co. ..... 26
Locke, Inc. .....19, 20

Macallen Co. ..... 34
Matthews Corp., W. N.....60, 61
McGraw-Hill Book Co., Inc...182, 184
Moloney Electric Co..... 84
Motorola, Inc. ..... 31
Murray Mfg. Corp.....Second Cover

Ohio Brass Co..... 135
Okonite Co., The..... 4

Page Steel & Wire Div., American Chain & Cable..... 176
Palnut Co. ..... 181
Penn-Union Electric Corp..... 21
Pennsylvania Transformer Co.... 12
Petersen Engineering Co..... 185
Porcelain Insulator Corp..... 164
Preformed Line Products Co..132, 133
Pritchard & Co., J. F..... 169

Radio Corp. of America, Engineering Products Dept..... 173
Railway & Industrial Engineering Co. ..... 39
Reliable Electric Co..... 75
Reynolds Metals Co..... 38
Riley Stoker Corp.....8, 9
Rockbestos Products Corp..... 137
Rome Cable Corp.....80, 81
Russell & Stoll Co..... 170
Ryerson & Son, Inc., Joseph T.... 175

Sangamo Electric Co..... 62
Searchlight Section .....189, 190, 191
Simplex Wire & Cable Co..... 33
Spang-Chalfant Div. of National Supply Co. ..... 41
Speco, Inc. ..... 186
Standard Oil Co., (Indiana) Fourth Cover
Star Porcelain Co..... 186
States Co., The..... 178

Triangle Conduit & Cable Co.... 71
Tulsa Winch Div. of Vickers Inc.. 172

United States Steel Co....22, 23, 49, 144, 145
Uptegraff Mfg. Co., R. E..... 69

Victor Insulators, Inc..... 151

Wagner Electric Corp.....140, 141
Weaver Co., J. A..... 65
West Virginia Pulp & Paper Co... 186
Westinghouse Electric Corp. ....10, 11, 28, 37, 48, 58, 59, 66, 67, 72, 73
Weston Electrical Instrument Corp. ..... 171
Worthington Pump & Machinery Corp., Steam Power Div..... 40


■


PROFESSIONAL SERVICES ..... 188


■

SEARCHLIGHT SECTION
*(Classified Advertising)*


EMPLOYMENT
Positions Vacant ..... 189
Selling Opportunities Offered ..... 189
Positions Wanted ..... 189
Employment Services ..... 189

EQUIPMENT
(Used or Surplus New)
For Sale .....190-191

WANTED
Equipment ..... 189

# PROFESSIONAL SERVICES

## BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
36 State Street, Albany, N. Y.

## BLACK & VEATCH

*Consulting Engineers*

Electricity—Water—Sewage—Industry

Reports, Design, Supervision of Construction, Investigations, Valuation and Rates

4706 Broadway — Kansas City 2, Missouri

## DAY & ZIMMERMAN, INC.

*Engineers*

Design - Construction - Management
Investigations and Reports

New York — Philadelphia — Chicago

## Doble Engineering Company

*Electrical Insulation Engineers*

Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr. Chicago, Ill.

## Ebasco Services Incorporated

*Engineers - Constructors - Business Consultants*

Design and Construction
Financial and Operating Consultation
Investigations and Reports
Consulting Engineering

Two Rector Street — New York
Chicago • Washington, D. C.

## ELECTRICAL TESTING LABORATORIES, INC.

Laboratory Factory and Field Investigations
Inspections and Associated Services
Certification

2 East End Avenue at 79th St., New York 21, N. Y.

## ROBERT E. FOLEY CONSTRUCTION CORPORATION

Design—Surveys—Appraisals
Construction & Maintenance

Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers

48 Griswold St. — Binghamton, N. Y.

## FORD, BACON & DAVIS

*Engineers*

DESIGN . CONSTRUCTION
VALUATIONS . REPORTS

New York . Philadelphia . Chicago . Los Angeles

## GILBERT ASSOCIATES, Inc.

*Engineers and Consultants*

DESIGN AND SUPERVISION OF STEAM, HYDRO, WATER SUPPLY, SEWAGE DISPOSAL AND DIESEL PLANTS
Reports . Rates . Labor Relations . Safety
Purchasing . Costs . Laboratory

New York — Reading, Pa. — Washington
Houston — Philadelphia

## W. C. GILMAN & COMPANY

*Consulting Engineers*

Load and Capacity Studies — Rate Cases
Financial Planning
Investigations — Reports — Supervision

55 Liberty Street — New York 5

## HARZA ENGINEERING CO.

*Consulting Engineers*

L. F. HARZA
E. MONTFORD FUCIK CALVIN V. DAVIS
Hydro-Electric Power Projects
Transmission Lines, System Management,
Dams, Foundations, Harbor Structures,
Soil Mechanics

400 W. Madison St. — Chicago 6, Ill.

## HOOSIER ENGINEERING COMPANY

*Erecting Engineers*
*Transmission Lines, Substations*

1384 Holly Avenue, Columbus, Ohio
327 South LaSalle Street, Chicago, Ill.
136 Liberty St., New York

## JACKSON & MORELAND

*Engineers and Consultants*

Design and Supervision of Construction
Reports — Examinations — Appraisals
Machine Design — Technical Publications

Boston — New York

## THE KULJIAN CORPORATION

*Engineers • Constructors*

1200 North Broad St., Philadelphia 21, Pa.
Washington, D. C.; Rome, Italy;
Calcutta, India; Caracas, Venezuela;
Mexico City, Mexico

## LARAMORE and DOUGLASS, INC.

*Consulting Engineers*

Power Plants
Transmission — Distribution
Design — Reports — Appraisals — Rates

79 East Adams Street
Chicago 3, Illinois

## N. A. LOUGEE & COMPANY

*Engineers and Consultants*

REPORTS — APPRAISALS
DEPRECIATION STUDIES — RATE CASES
BUSINESS AND ECONOMIC STUDIES

120 Broadway — New York

## LUCAS & LUICK

*Engineers*

DESIGN, CONSTRUCTION, SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES

231 S. LaSalle St., Chicago

## LUTZ & MAY

*Consulting Engineers*

STEAM, GAS & DIESEL POWER STATIONS
PUMPING PLANTS—ELECTRIC SYSTEMS
REPORTS—DESIGN—APPRAISALS

1009 Baltimore — Kansas City 6, Mo.

## ARTHUR L. MULLERGREN

*Engineering-Management*

*Public—Utilities—Natural Gas*

Kansas City, Mo.

## PIONEER SERVICE & ENGINEERING CO.

Consulting and Design
Engineers . . Purchasing . .
Specialists in Financing
Accounting and Other Operations

231 So. La Salle St. — Chicago 4

## Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES
THE ONE-STEP METHOD

*Bill Frequency Analyser*

100 Sixth Ave. WOrth 4-8326 New York 13, N. Y.

## REIS & CHANDLER, INC.

ADVISORS TO UTILITIES

Financing—Rate of Return

30 Vesey Street, — New York 7, N. Y.

## SANDERSON & PORTER

*Engineers and Constructors*

New York • Chicago • San Francisco

## SARGENT & LUNDY

ENGINEERS

140 South Dearborn St.

Chicago, Ill.

## F. W. SCHEIDENHELM

*Consulting Engineer*

Hydraulic Engineering, Hydro-electric Development, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals.

50 Church Street, — New York 7, N. Y.

## F. A. TUCKER, INC.

*Contractors—Engineers*

specialize in
Distribution - Transmission - Telephone lines - Maintenance - Roads - Bridges Dams

Main Office—38½ Center Street, Rutland, Vt.
Branch Office—120 East 3rd St., Charlotte, N. C.

## CHAS. T. MAIN, INC.

*Engineers*

Electric, Steam and Hydraulic Projects, Investigations, Reports, Designs and Appraisals

Chamber of Commerce Building
80 Federal St., Boston 10, Mass.

## MIDDLE WEST SERVICE CO.

*Practical and Experienced Consultants*

20 N. Wacker Drive — Chicago

## UTILITIES LINE CONSTRUCTION COMPANY, INC.

*Construction and Maintenance*

Transmission-Distribution
Electric and Telephone Lines
Consultants

501 York Road, — Jenkintown, Pa.

## THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

# SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

**UNDISPLAYED RATE:**

**$1.20 a line, minimum 3 lines.**
**To figure advance payment count 5 average words as a line.**

**INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of above rate, payable in advance.**

**PROPOSALS, $1.20 a line an insertion.**

**INFORMATION:**

**BOX NUMBERS count as 1 line additional in undisplayed ads.**

**DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)**

**EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.**

**DISPLAYED RATE:**

**The advertising rate is $11.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.**

**AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E. W.**

*NEW ADVERTISEMENTS received by Nov. 23rd in the N. Y. C. office will appear in the Dec. 3rd issue subject to limitation of space available.*

*REPLIES (Box No.): Address to office nearest you*
*NEW YORK: 330 W. 42nd St. (18)*
*CHICAGO: 520 N. Michigan Ave. (11)*
*SAN FRANCISCO: 68 Post St. (4)*

## POSITIONS VACANT

ASSISTANT MANAGER and Superintendent—For electric and combination utility in Southwest or Northwest. Please furnish complete resume of experience, qualifications, references, and salary requirements. P-2438, Electrical World.

ELECTRICAL DESIGN engineer, recent graduate, experience not necessary, for small, well established manufacturer of transformers. P-2368, Electrical World.

ELECTRICAL HEATING Specialist. Opportunity with stable, mid-western utility situated in thriving industrial area. Requires experience in promoting application of electrical heating in industrial plants. No traveling. Salary commensurate with ability. Submit resume of education, experience and personal data to P-2282, Electrical World, 520 N. Michigan Avenue, Chicago, Illinois.

MANAGER, COMBINATION Utility — predominantly electric, administrative and sales ability important, technical background desirable. Permanent position and substantial opportunity for qualified person. Replies confidential. Submit complete details including salary requirements. P-2466, Electrical World.

MAN EXPERIENCED in overhead line construction. Must be capable of supervising installation of aluminum conductors, familiar with accessories and their application. Administrative ability relative to conductor stringing specifications involved. P-2425, Electrical World.

## EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

## POSITIONS WANTED

CHIEF ENGINEER and Consultant—Broad experience and knowledge of Electric Utility Power System Planning, Design, Construction, Operation and Maintenance. Some Chemical and Refinery plant experience. Employed. Resume and excellent references available. PW-2427, Electrical World.

SUPERINTENDENT OF Municipal Power Plant wants same position with Industrial Co. or Co-op. Dual fuel and Distribution experience. Good Record. PW-2416, Electrical World, 520 N. Michigan Av., Chicago.

## PART TIME WORK WANTED

ELECTRICAL ENGINEER, 25 years experience, desires home work: Electrical calculations, design, estimates on hourly or contract basis. PTWW-2362, Electrical World.

ELECTRICAL ENGINEER wants free lance translation work from German, French or Russian into English. PTWW-2361, Electrical World.

## GENERAL ENGINEER
### *ELECTRICAL GRADUATE*

**Experienced in application of relays, control and power apparatus to Central Stations and Substations by established consulting organization for work in a continuing program of plant expansion for foreign public utility companies. Applicants should be capable of making short circuit, stability, calculating board studies, as well as doing a limited amount of estimating and design work and specification writing for related electrical equipment. Permanent position, location New York, limited foreign travel. Attractive salary. Splendid opportunity for right man. Reply, stating age and fullest detail of qualifications and experience.**

**P-2413,** Electrical World
330 W. 42 St., New York 18, N. Y.

**Electrical Engineers with some experience in substation and power plant design. Pleasant working conditions. Location in ideal home community. Write:**

**W. B. MORTON**
***Station Electrical Engineer***
**Pennsylvania Power & Light Co.**
**Allentown, Pa.**

## *WANTED*

**Hot Line Tool Demonstrator to set up sales program, select and assist jobbers and manufacturers representatives in the sale of Hot Line Tools, Clamps, Temporary Grounding and allied equipment. Send full qualifications, experience record, salary desired. Submit picture with letter of application.**

**SW-2433,** Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

## WANTED

### *WANTED FOR CASH*

**ELECTRIC MOTORS — STARTERS**
**TRANSFORMERS — OIL & AIR BRKRS.**
**WIRE — CABLE — WIRING MATERIALS**
***SEND LISTINGS***

**ALLIED ELECTRIC & MACHINERY CO.**
**1007 Falls Bldg., P. O. Box 1838**
**Memphis, 1, Tenn.**

**BUYERS OF SURPLUS COPPER INSULATED WIRES AND CABLES**

**No lengths too long or too short**

***Telephone: Eastgate 7-4778***

**PIERCE CABLE CO.**
**2670 Clybourne Ave. Chicago 14, Illinois**

## ELECTRICAL
## Chief Engineer

**Chief Electrical Engineer, capable of supervising large electrical design division, required for permanent position in large industrial engineering firm located in the Midwest. Must be fully experienced technically, as well as administratively.**

**Submit complete record stating experience, education, salary required and availability. Interviews arranged with qualified applicants. All replies confidential.**

**P-2397,** Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

## EXECUTIVE VICE PRESIDENT

**Progressive, well established manufacturer of switching devices and controls is seeking an executive vice president with heavy engineering and production background. Must be trained engineer, electrical engineering degree preferred, and strong operating man. The man we seek is now in a broad gauged executive capacity in small electrical products. Medium size plant is located in Chicago. Salary commensurate with qualifications. This is an unusual opportunity for an aggressive producer. Replies held in strict confidence.**

**P-2417,** Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

**WANTED:** Experienced Power Station Engineer.
**POSITION:** Assistant to Manager of Power Production with administrative responsibility of operating central stations totaling approximately 800,000 kw.
**LOCATION:** Pennsylvania.
**ADVANCEMENT:** Excellent for growth on job and promotion in near future.
**EXPERIENCE:** 10 years minimum, with at least 5 years in operation, maintenance or efficiency work in large modern steam-electric central station. Construction and design experience will be considered.
**EDUCATION:** B.S. degree in Mechanical (preferred) or Electrical Engineering from an accredited engineering college.
**AGE:** 30-45.
*Salary commensurate with qualifications*
All applications will be acknowledged. Please send personal record to

**P-2130,** Electrical World
330 W. 42 St., New York 18, N. Y.

**WANTED**

## SALESMAN or AGENCY

**Experienced in sale of power and distribution transformers for Chicago district**

**SW-1778,** Electrical World
330 W. 42 St., New York 18, N. Y.

# DIESEL POWER

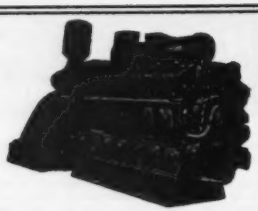
FOR

IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA

A.C.—50 AND 60 CYCLES

VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

| KVA | Make | Model | HP | RPM | KVA | Make | Model | HP | RPM |
|---|---|---|---|---|---|---|---|---|---|
| 1875 | Fairbanks Morse | 33F16 | 2000 | 900 | 375 | Enterprise | DSG-6 | 450 | 450 |
| 1430 | Fairbanks Morse | 38D8½ | 1600 | 720 | 280 | Superior | KNA | 336 | 514 |
| 1250 | General Motors | 16-278A | 1600 | 720 | 312 | General Motors | 8-268A | 450 | 1200 |
| 937.5 | General Motors | 12-567 | 1080 | 720 | 312 | Clark | MD-4 | 375 | 257 |
| 625 | Alco | 6-13¼x18T | 750 | 600 | 125 | Ingersoll Rand | 8 | 225 | 514 |
| 625 | Baldwin | VO-6 | 810 | 450 | 187 | General Motors | 3-268A | 150 | 1200 |
| 400 | Buckeye | 80 | 480 | 600 | 75 | General Motors | 6043C | 90 | 1200 |

D.C. UNITS ALSO AVAILABLE

**A. G. SCHOONMAKER COMPANY, INC.**

ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

# FOR SALE

1—General Electric, type MT-6344 frame, 250 HP, 720 RPM, 440 volt, 3 phase, 60 cycle, wound rotor induction motor, 3 sleeve bearings. Complete with base and slide rails but less starting equipment. Purchased new in 1950.

1—Westinghouse A.C. motor, 400 HP, 3 phase, 60 cycle, 2300 volt, full load speed 1782, frame 4-32-13, type CS, splashproof, serial #1813P748. Also starting equipment. Purchased new in 1940.

**NEKOOSA-EDWARDS PAPER CO.**

Port Edwards, Wisconsin

FOR SALE

1—**GENERAL ELECTRIC** Three-phase, 2300-volt, 90 KVA 5/10% **INDUCTION VOLTAGE REGULATOR**, Type 1RT-2 Ser. 4006852.

2—**WESTINGHOUSE** Three-phase, 2300-volt, 80 KVA 10% **INDUCTION VOLTAGE REGULATORS**, S.O. 27M12 Ser. 3024656 and Style No. 57C318 Ser. 4703075.

FS-2406, Electrical World
330 W. 42 St., New York 18, N. Y.

# J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd St., NORTH BERGEN, N. J. — N.Y.C. Tel. LOngacre 5-3227 — N. J. Tel. UNion 3-2600

**TRANSFORMERS**

1—1500 KVA Whse., 3 Ph., 34, 300/69,700-480V
3—1500 KVA Pittsburgh, 1 Ph., 22,900-2200V
1—1500 KVA G.E., 3 Ph., 415V, 2300V Pyranol
2—400 KVA Pittsburgh, 1 Ph., 2400/4800-240/480 Scott-Taps
3—400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1—200 KVA G.E., 3 Ph., 2400-220 Sec.
2—50 KVA Whse., 1 Ph., 2400V 120/240 Inerteen
6—50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.

**SYNCHRONOUS MOTORS**

1—300 H.P. Elec. Mach. 720 RPM, 3 Phase 60 cy., 2200V. Totally Enclosed Fan Cooled Outdoor service.

**MOTOR GENERATOR SETS**

1—1000 KW G.E., 600 V, 514 RPM, 4000V Syn.
1—200 KW Whse., 275V, 900 R.P.M., 220 V. Syn.
1—176 KVA West., 1 Ph. 220V, Motor 3 Ph., 400V.
1—150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1—75 CW., 250V, 1200 RPM., 2400V. Syn.

**SLIP RING MOTORS**

1—2500 HP G.E., MT. 257 RPM 6600V.
1—250 HP West., CW, 600 RPM, 440V.

**SYNCHRONOUS CONDENSER**

1—2500 KVA Whse., 720 RPM, 2200V with D.C. Exc.

Large Stock of A.C. and D.C. Equipment

# GENERATOR

*Suitable for use as*

**Synchronous Condenser**

Rewound & overhauled by GE Co.
*(In original crates)*

3500 KW, 80% PF., 3/60/2400, 3600 RPM.

*Very Attractively Priced for Quick Disposal*

**STEPHEN A. DOUGLASS CO.**

630 Fort Washington Ave., New York 33, N. Y.

# TRANSFORMERS

FOR SALE

1 Phase, 60 Cycle

3—500 KVA G-E 66000—2300
2—500 KVA W-H 13200—240/480
3—400 KVA W-H 13200—600/575/550
1—400 KVA G-E 13200—120/240 Pyranol
3—333 KVA G-E 44000—6600
3—250 KVA W-H 13800—2300
3—200 KVA G-E 13200—120/240
3—250 KVA Kuhl 6600—575
3—150 KVA G-E 44000/33000—2400/500
3—150 KVA Pitts 22000—575
3—150 KVA G-E 19050/33000Y—2540/2300
3—150 KVA A-Ch 13800—2300
3—100 KVA G-E 33000—6900/11950Y
3— 50 KVA G-E 33000—2400/4160Y
3—100 KVA G-E 2400—240/480, 25 cycle

*Many other items in stock*

**TRANSFORMERS WANTED**

Reliable rewind and repair service on all makes of transformers

**THE ELECTRIC SERVICE CO.**

CINCINNATI 27, OHIO

# OPPORTUNITIES!

*in*

*New and used equipment recently released from service by a number of electric and gas utility companies*

POWERPLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

*Send for new list, . . . to*

**EBASCO SERVICES INCORPORATED**
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

The Memphis Light, Gas & Water Division, Memphis, Tennessee, offers for sale, in good operating condition, f.o.b. cars, Memphis, transportation collect, two Westinghouse rotary converters with Westinghouse transformers, which may be seen at the Division's Beale Street Substation, name plate data as follows:

ROTARY—200 KW, 600 volt d.c., 333 d.c. amps, 3 phase, 60 cycle, 1200 rpm, Style #180618A, Serial #1281831; accompanying transformers — 3—Type SK, 75 KVA, volts 6600/326/190, Style #L-130541-A, Serial Nos. 334380, 334381, 334384.

ROTARY—200 KW, 600 volt d.c., 333 d.c. amps, 3 phase, 60 cycle, 1200 rpm, Style #180618A, Serial #1281832; accompanying transformers — 3—Type SK, 75 KVA, volts 6600/314/194, Style #L-130541-A, Serial Nos. 334382, 334385, 334383.

Price for each unit, including transformers, is $1,000.00. Address inquiries to C. S. Beatus, Director of Purchases, Stores & Supplies.

NEW
Guaranteed Rebuilt
MOTORS-GENERATORS-CONTROLS
NOW IN STOCK
We buy surplus equipment
**L.J. LAND Inc.**
Box 756 Reading-5Pa

# SUB STATION FOR SALE

G. E. indoor 450 KVA, 13200-208/120 Volt, Spare transformer, voltage regulator, primary oil switches, copper buss & insulators. Complete. Now Operating. Available 30 days.

**C. F. CURRY REAL ESTATE CO.,**
20 W. 9th St. Bldg., Kansas City, Mo.

MOTORS, GENERATORS, TRANSFORMERS
1 – 1500 H.P.
Bought and Sold
New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

# "SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

**Take Advantage Of It**

*For Every Business Want*

"Think SEARCHLIGHT FIRST"

## SUBSTATION EQUIPMENT

### TRANSFORMER

| QU. | KVA | MFR. | VOLTAGE |
|---|---|---|---|
| 1 | 7500 | G.E. | 138000—41000, 3 ph. |
| 3 | 8333 | West. | 132000—7620/13200 Y |
| 4 | 2000 | West. | 69000—13800 |
| 3 | 500 | G.E. | 66000—2400 |
| 4 | 2500 | West. | 44000—11000 |
| 3 | 1500 | Wag. | 44000—6900 NEW |
| 3 | 200 | Mol. | 44000/22000—440/220 |
| 3 | 100 | G.E. | 44000—2300 |
| 3 | 75 | West. | 44000—7200/12470 Y |
| 3 | 8333 | West. | 43800—13900 |
| 1 | 18750 | A.B.B. | 34840—11000, 3 ph. |
| 6 | 1500 | Pitts. | 33000—2400 |
| 3 | 200 | West. | 33000—7200/12470 Y |
| 4 | 150 | G.E. | 33000—7200/12470 Y |
| 3 | 100 | A.C. | 33000—7200/12470 Y |
| 3 | 75 | Mol. | 33000—2300/6900 |
| 3 | 75 | Wag. | 33000—7200/12470 Y |
| 3 | 50 | G.E. | 33000—2300/4000 Y |
| 4 | 450 | A.C. | 25410/44000—13250/23000 |
| 3 | 50 | West. | 22000—2300 |
| 2 | 667 | Pitts. | 13200—2200 |
| 3 | 200 | Mol. | 11000—2300 |
| 3 | 150 | Mol. | 7620/13200 Y—120/240 |
| 3 | 667 | Kuhl. | 7200/12470 Y—2400 |
| 3 | 100 | West. | 7200/12470 Y—2300 |
| 3 | 75 | West. | 6600—460/230 |
| 1 | 100 | G.E. | 2300—575, 3 ph. |

### INDUCTION REGULATORS

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
2—120 KVA G. E. 500/1000 A. 2400 V. O/D
2— 46 KVA West. 200/400 A. 2300 V.
6— 36 KVA G. E. 150 A. 2400 V.
2— 36 KVA G. E. 75/150 A. 4800 V.

### CIRCUIT BREAKERS

4—600 A. 154 KV G. E. FHKO- 39-2500 MVA
1—600 A. 73 KV G. E. FHKO-236- 500 MVA
1—400 A. 37 KV G. E. FHKO-136- 350 MVA
1—400 A. 37 KV West. 0-221-5— MVA
1—400 A. 15 KV G. E. FKO-37-40
4—600 A. 15 KV G. E. FHKO-139- 750 MVA

**BREW, WOLTMAN & CO., INC.**
**52 Church St., New York 7, N. Y.**

## GUARANTEED "REBUILT" POWER EQUIPMENT

**HERE'S A PARTIAL LISTING OF OUR GIANT STOCK THAT COVERS UNITS OF EVERY SIZE AND DESCRIPTION**

### SQUIRREL CAGE MOTORS

3 Phase, 60 Cycle, 220 or 440 volts (*2200 volts or higher)

| H.P. | MAKE | TYPE | SPEED |
|---|---|---|---|
| 1000 | *G.E. | K63475 | 1800 |
| 750 | *G.E. | KT | 720 |
| 500 | *G.E. | PBG | 1800 |
| 500 | *Fr-Morse | M15 | 1200 |
| 400 | *Cent (new) | NZ | 1800 |
| 400 | *Al-Ch | ARWW | 900 |
| 300 | *Westgh | CS | 3600 |
| 300 | G.E. | FT-559 | 1800 |
| 300 | Al-Ch | AR | 900 |
| 250 | L-Allis | 1465 | 720 |
| 250 | Westgh | CS | 1800 |
| 150 | G.E. | IE | 1800 |
| 150 | *Al-Ch | AW | 1800 |
| 125 | Westg (new) | CS586 | 3600 |
| 125 | G.E. TEFC | K63265 | 1200 |
| 120 | G.E. (new) | K6333 | 900 |
| 100 | *G.E. | FT542Z | 1800 |
| 100 | U.S. (Vert) | CFU | 1200 |
| 100 | Westg | CS | 1200 |
| 100 | G.E. (new) | K6333 | 720 |
| 75 | Westg | CS761 | 1800 |
| 75 | G.E. | K585 | 1200 |
| 75 | G.E. | K6333 | 720 |
| 75 | *G.E. | IK | 720 |
| 60 | G.E. (new) | K444S | 1800 |
| 60 | G.E. (new) | K504U | 1200 |
| 60 | Al-Ch | AR826F | 514 |
| 50 | U.S. (vert) | SCW | 1800 |
| 50 | Westg | CS574 | 1200 |

Hundreds of Smaller Motors!

### SLIP RING MOTORS

Crane and Hoist Type 745/60/220 or 440 Volt

| H.P. | MAKE | TYPE | SPEED |
|---|---|---|---|
| 75 | Westgh. | C1756A | 600 |
| 37 | G.E. | MITC (TENV) | 600 |
| 25 | Westgh. | C1572 | 900 |
| 22 | G.E. | ITC5009 | 1200 |
| 20 | Westgh. | C1 | 900 |
| 15 | G.E. | ITC5010-25 cy. | 720 |
| 11 | Westgh. | C1464 | 900 |
| 5½ | R & M | 425A (TENV) | 1200 |
| 3 | G.E. | MTCS168 | 1200 |

### DIESEL-GENERATORS (2)

NEW—31.25 KVA Rogers AC Generators, 3/60/120/208, D/C Exciter driven by direct-connected Cummins Diesel Engine. Model H-I. Complete Control Panel.

### AC SYNCHRO-GENERATORS

3 Phase, 60 Cycle, 220 or 440 Volts (*2200 volts or higher)

| KVA | MAKE | TYPE | P.F. | Spd. |
|---|---|---|---|---|
| 1500 | G.E. | ATI | .8 | 900 |
| 1000 | *Westgh. | 803D | .8 | 900 |
| 250 | Al-Ch (New) | | .8 | 720 |
| 150 | El. Machy | EM | .8 | 720 |
| 112.5 | *G.E. | ATB | .8 | 1200 |
| 110 | Cr-Wh | 103 | .8 | 900 |

### 1000 KW MOTOR-GENERATOR SET—3-UNIT

2—500 KW Westgh. DC Gens. 275/137.5 V. 3 wire. 1820 Amps. D/C TO 1420 HP Westgh. Syn. Motor, 900 RPM 11,000 V. 60 Cy., 3 Ph. 3 Brg. on Castiron Factory Base.

### AIR COMPRESSORS

| SIZE | MAKE | TYPE | DISPL. | PSI. |
|---|---|---|---|---|
| 10 x10 | Ing-R. | ERI | 223 | 120 |
| 10 x8 | Ing-R. | DRI | 179 | 65 |
| 9 x9 | Worth. | HB | 231 | 100 |
| 9 x8 | Ing-R. | ERI | 445 | 100 |
| 8½x8 | Worth. | HB | 179 | 100 |
| 7 x7 | Worth. | HB | 122 | 100 |

### AC SYNCHRONOUS MOTORS

3 Phase, 60 Cycle, 220 or 440 Volts (*2200 Volts or Higher)

| H.P. | MAKE | Type | P.F. | Speed |
|---|---|---|---|---|
| 800 | G.E. | TS804 | 1.0 | 1800 |
| 750 | *Westgh. | | .8 | 900 |
| 700 | G.E. | TS | | 514 |
| 320 | *A.C. | Dr Pf | 1.0 | 720 |
| 300 | Cr-Wh. | ENG | 1.0 | 360 |
| 250 | *A.C. | Dr Pf | .8 | 720 |
| 220 | G.E. | ATI | 1.0 | 600 |
| 150 | El. Machy. | Ped | 1.0 | 150 |
| 150 | El. Machy. | EM | .8 | 720 |
| 150 | *Westgh. | | 1.0 | 300 |
| 125 | *El. Machy. | SYN | 1.0 | 900 |
| 125 | Cr-Wh. | 1035 | 1.0 | 900 |
| 125 | *G.E. | TS | 1.0 | 277 |
| 115 | El. Machy. | EM | 1.0 | 240 |

Phone Canal 6-2900 Today

**CHICAGO Electric Co.**

Write for Stock List

**1324 W. Cermak Road • Chicago 8, Illinois**

## FROM AVAILABLE STOCK

### TURBO GENERATORS

| Qu | KW | Make | Desc. |
|---|---|---|---|
| 1 | —6000 | Al. Ch. | Condensing 200/250 I.S.P. 2300 v. 3/60 Exc. & Surface Cond. |
| 2 | —750 | G.E. | Condensing — 425 lbs. 750 TT. I.S.P. 440v. 3 ph. 60 cy.—Built 1944 |
| 1 | —400 | Westg. | Non-condensing — 125/150 lbs-I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy. |
| 1 | —300 | G.E. | Non-condensing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy. |

### SYNCHRONOUS CONDENSERS

| KVA | Make | Type | Volts | Speed |
|---|---|---|---|---|
| 1—5000 | Whse. | | 2400/4150 | 600 |

### MOTOR GENERATOR SETS

3 ph. 60 cy.

| Qu | KW | Make | Speed | DC Volts | AC Volts |
|---|---|---|---|---|---|
| 2 | —2000 | G.E. | 500 | 666 25 cy. | 11000 |
| 1 | —1500 | G.E. | 720 | 600 | 13200 |
| 1 | —1500 | G.E. | 360 | 275 | 2200/4400 |
| 1 | —1000 | Whse. | 900 | 600 | 4150 |
| 1 | —1000 | G.E. | 900 | 260 | 4100/6900 |
| 1 | — 750 | Whse. | 900 | 275 | 2300/4150 |
| 2 | — 500 | Whse. | 900 | 250 | 6600/13200 |
| 1 | — 500 | Whse. | 1200 | 125/250 | 2300 |
| 1 | — 500 | G.E. | 900 | 600 | 2300/4000 |
| 1 | — 500 | Whse. | 900 | 250 | 440 |
| 1 | — 500 | G.E. | 720 | 125 | 2300 |
| 1 | — 400 | G.E. | 720 | 250 | 440/2300 |
| 1 | — 350 | G.E. | 900 | 125 | 4150 |
| 1 | — 240 | G.E. | 1200 | 250 | 2300 |

### TRANSFORMERS—60 Cycle

| KVA | Make | Type | Ph | Voltages |
|---|---|---|---|---|
| 1—4000 | G.E. | RI | 3 | 22000x2300 |
| 3—1500 | Pitts. | OISC | 1 | 22000/2300 |
| 3—1250 | G.E. | HVDDJ | 1 | 6600x550 |
| 3— 500 | A.C. | OISC | 1 | 13200/2300 |
| 6— 300 | G.E. | BT | 3 | 2400x240/480 |

**BELYEA COMPANY, INC.**

**OFFICE & SHOP**
**51 Howell St., Jersey City 6, N. J.**

## FOR SALE

1 Outdoor Type

## General Electric

Oil

## Circuit Breaker

**Catalog 2507302G2. 37 KV, 400 Ampere, Interrupting Capacity 50,000 KVA. Now in use and in First Class operating Condition.**

**MALLEABLE IRON FITTINGS CO.**
**BRANFORD, CONN.**

### ELECTRIC CABLE

- for every industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular supplier.
- Cut to length. Reasonably priced.

**UNIVERSAL Wire and Cable Co.**
2870 N. Clybourn Ave. Chicago 14, Ill.

### DIESELS—FOR SALE

**2—1250 HP, 4 cycle, 164 RPM Macintosh Seymour diesel engines driving 850 KW, 2 phase, 2300 volt, 60 cycle generators (can be rewound 3 phase). Units now in Central Station operation, probably available May 1952. Contact Commissioner of Public Utilities, Rockville Centre, N. Y.**


## TENDER NOTICE

The Director General of Supplies and Disposals, Shahjahan Road, New Delhi, invites tenders for the supply of stores noted below, so as to reach him on or before 4 P. M. on Nov. 27, 1951.

**'Wire Contact Hard Drawn, Copper, Solid with Grooves on either side for gripping by droppers having a cross sectional area of 0.25 sp. in. to be supplied in durms that will fit into the stands of the reel wagon, as per Specification D-20'**

Tender Forms (not transferable) No. SE3/16091-A/11/Wires may be obtained from India Supply Mission, 635 F Street N.W., Washington, D. C., U.S.A., on payment of the Tender Fee of $2.43 (not returnable) per set (inclusive of prices of Drawings/Specification).

# LETTERS TO THE EDITOR

## Figures Not Dependable

To the Editor:

Having recently completed a little reading on the St. Lawrence power project, a statement in Electrical World, October 29, 1951, page 19, attracted my attention. Under the title "N. Y. Authority Studying State Interconnections" appears this statement: "Niagara is to have 1,132,000 kw of dependable power, St. Lawrence about 940,000 kw."

From the Great Lakes-St. Lawrence Basin Hearings before a Subcommittee of the Committee on Foreign Relations, United States Senate, 79th Congress, Second Session on S. J. Res. 104, February 18 to March 9, 1946, Mr. Leland Olds testified:

"Turning to the proposed power plant on the United States side of the boundary . . . it is proposed to install in that plant a generating capacity of 940,500 kw. This will provide a capacity at times of minimum head of about 700,000 kw, and will provide in terms of continuous power 570,000 kw. In other words, it will be possible to get 570,000 kw at all times, continuously out of this project . . ."

In a booklet entitled "Facts about Great Lakes-St. Lawrence Seaway and Power Project," published by the Great Lakes-St. Lawrence Association, the following statement may be found on page 4:

"The power could be sold "at site" for 1.77 mills per kwhr. This is based on an average annual production of 6.3 billion kwhr (installed capacity 940,500 kw, dependable capacity 700,000 kw)."

The two quotes would give the impression that Electrical World was really stating installed generating capacity, not dependable capacity. In addition, I feel that most news items on the St. Lawrence power project merely mention the kilowatts and kilowatt-hours that will be available from the project. In all fairness to the utilities in the area involved, the total generating capacity in that area (N. Y. 6,259,487 kw, 1950) should be mentioned in order to present the economic importance of the project in the proper proportions.

R. W. Boyd
The United Illuminating Co
New Haven 6,
Connecticut

Editor's Note: At a conference on a treaty with Canada concerning water rights on the Niagara River, which treaty was signed on Feb. 27, 1950, E. Robert deLuccia, chief of FPC's Bureau of Power, stated that redevelopment of the Niagara would yield 1,132,000 kw of dependable power. But reader Boyd assumes correctly on the second count. In its application to FPC to build the St Lawrence project, the Power Authority of the State of New York gives 940,000 kw as installed capacity and 700,000 kw as dependable.

## Keep Prone Pressure Method

To the Editor:

My attention has been called to an editorial entitled "Resuscitation" on page 102 of the October 8 issue of Electrical World. A number of organizations are considering the problem of what method of artificial respiration to teach. . . . We have a great deal of information that would probably be of interest to your readers.

Of course, the Red Cross would not change from the prone pressure method unless a new method were feasible for field use, adapted to a public education program, and supported by sufficient evidence, including medical evidence, to indicate its superiority in meeting physiological needs. The public utilities have had opportunity through their representatives to become better acquainted with the accumulated evidence and to learn the points of view of medical authorities and others who carry on teaching programs. They are certainly not bound because of such participation to change their method.

C. J. Potthoff, M.D.
Director
The American National Red Cross
Washington 13, D. C.

## Happy to Oblige

To the Editor:

Do you remember that snappy editorial ("Prize Awards," p 78, October 9, 1950) you printed about a year ago building hot little fires under those utility boys who had had a successful year, urging them to send entries to the Prize Awards Contests of EEI? That editorial, you know, received much favorable comment and did the job among the utilities it set out to do.

I have written "Electrical Merchandising" and "Electric Light & Power," holding your last year's piece up as an example, and asking them to follow it for the 1952 Prize Awards publicity. That being the case, I hope you will see your way clear to take pen in hand and outdo last years' piece in an early issue of Electrical World.

Clara Zillessen
Exton
Pennsylvania

Editor's Note: Since we set the example, who better can follow it? And we shall.

## Power Cable Trade Names

To the Editor:

My congratulations on doing a very good job of collecting together, in one place, the trade marks and trade names for insulated wire and cable ("Trade Marks and Trade Names For Power Cables, Wire and Insulation," EW, November 5, 1951, page 142).

Undoubtedly all of the wire and cable companies would like to have this information to distribute to their salesmen. Because it will take up four pages, why don't you print a four-page folder and offer it for sale. We would be glad to have a couple hundred of them if you decide to print them up.

E. J. MacKenzie
Advertising Manager
Simplex Wire & Cable Co
Cambridge 39, Mass.

Editor's Note: Electrical World is planning to reprint this article. As this issue went to press, a total of 5,500 reprints has been requested.

# CONTACT FEATURES

## OF DELTA-STARS

## NEW B-2K Outdoor Disconnect SWITCH

**Electrical and mechanical advantages formerly found only in the best of group operated switches are now incorporated in the new B-2K—greatly *improved thermal characteristics; high pressure, long-lived contacts; a more rigid blade construction; improved blade pryout and lock design* with large 3-inch hook ring.**

**CONTACTS**—The new design includes a high pressure contact that has ideal electrical and thermal characteristics. Hard drawn copper contact shoes of ample material for heat dissipation have heavy rolled silver inlays at points of contact which press firmly against the hard drawn copper blade. Pressure is maintained by fatigue resistant beryllium copper alloy cantilever springs with large spring deflection to compensate for loss of pressure due to wear over years of service. Springs are not required nor designed to carry current and therefore their material has been chosen primarily to secure and maintain the required pressure. The wiping action of the hard drawn copper blade against the abrasion resistant silver inlays assures a clean, low resistance contact at all times . . . in all weathers. The new B-2K has been designed to withstand all the rigors of weather and corrosive atmospheric conditions. Operation is easy even after standing in one position over a long period of time.

Contact at the hinge end is made by the blade operating against silvered hard drawn copper bars. Pressure is maintained by spring cup washers.

**This Modern Hook-Operated Outdoor Disconnect is available in single and double throw switches for upright and inverted mountings in current ratings of 600 and 1200 amperes and in voltages up to 161 kv.**

23 kv. 1200 ampere "B-2K" Disconnect

***Ask for Publication 5104***

**WHEN YOU WANT THE BEST IN HIGH VOLTAGE SWITCHING EQUIPMENT SPECIFY DELTA-STAR!**

**DELTA-STAR ELECTRIC COMPANY**

DIVISION OF H. K. PORTER COMPANY, INC.

2437 Fulton Street • Chicago 12, Illinois

DISTRICT OFFICES IN PRINCIPAL CITIES

# Over 250,000-KW Capacity Operating on . . .

## NONPAREIL
TRADE MARK
## Turbine Oil

● With the installation of a 45,000-KW turbine shown in the foreground of the illustration above, a large midwest utility now has six large turbines — over 250,000-KW capacity — operating on NONPAREIL Turbine Oil.

There is reason to believe that this new turbine will never have to be shut down for oil replacement, oil-system cleaning, or because of oil-acidity troubles. This conviction is based on the lubrication record of NONPAREIL Turbine Oil in this plant.

During *ten years of operation,* neutralization numbers have stayed below .07 mg. KOH/gm. There have been no time losses or troubles caused by high acidity. Oil systems have stayed clean. Such benefits are assured this company, not only for 10 years, but for the *life* of its turbines. This assurance is based on NONPAREIL'S written guarantee that it will maintain a neutralization number below 0.15 mg. KOH/gm.

**WITH NO OIL-ACIDITY OR OIL-REPLACEMENT WORRIES**

Why not end oil-system maintenance and oil-acidity troubles once and for all, by using NONPAREIL Turbine Oil in your turbines? For more evidence of these savings, ask a Standard Oil Lubrication Engineer to supply you data from 23-year service records of NONPAREIL Turbine Oil.

• • •

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

**STANDARD OIL COMPANY (INDIANA)** STANDARD